ESSAYS ON MEXICAN MIGRATION

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In this dissertation I study different aspects of the Mexican migration to the United States. First, I introduce one of the most complete sources of information of Mexican migrants in the United States, the Survey of Migration to the Northern Border. Then I study the selectivity of Mexican migration. I test Borjas' 1987 negative selection hypothesis which states that individuals migrating from states with more unequal income distribution and higher returns to education will be more negatively selected. I analyze the degree of selectivity of immigrants by exploiting the variation in returns to education and income inequality across Mexican states over time. I use Borjas' selection model to infer worker's unobservable skills. The results support Borjas' hypothesis, there is evidence of negative selection in terms of years of schooling and unobservable skills. Moreover, I predict the wages in the United States of recently arrived migrants and find that higher income inequality is associated with lower observable skills.

One channel through which migration may reduce poverty is by enhancing the asset positions and productivity levels of poor households, either via remittances, savings, and human capital accumulation. In this dissertation I assess the impact of return migration on self-employment exploiting the variation in return migration rates to different states of Mexico. I predict return migration to different Mexican states by using past migration patterns and use these predicted rates as instruments for return migration avoiding potential endogeneity issues. The results show that return migration exerted a positive but small impact on the probability of self-employment in Mexico between 1999 and 2010.

In recent years, Mexico has experienced a dramatic surge in homicides driven by the

violent struggle between and within criminal organizations to control the drug trade business. In the last chapter I study the effect of drug-violence on the outflows of migrants from Mexico to the United States. The results show that individuals from Western and Southern Mexico are more likely to change their migratory behavior in response to changes in violence. Violence increases migration rates from Western Mexico but decreases migration rates from Southern Mexico.

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PREFACE

This work would not have been possible if not for the support and encouragement of many people. To all of you, thank you very much.

1.0 INTRODUCTION

One of challenges of studying Mexican migration and particularly undocumented migration to the United States is the lack of information. While migrants are observed in household datasets conducted in the US such as the Current Population Survey (CPS) or the US Census, those surveys do not allow us to identify migrants by legal status and are likely to undercount temporary, circular, and undocumented migrants.

A very complete source of information of Mexican migrants in the United States is the Survey of Migration to the Northern Border (EMIF). The survey is a cross sectional survey that has been conducted seventeen times between 1993 and 2012 by Mexican authorities in seven Mexican border cities.

The EMIF consists of four different questionnaires that quantify the flows of migrants going into and out of Mexico. The first one is conducted among northward-bound migrants with destinations in either Mexican border cities or the US; the second one is conducted among migrants returned to Mexico by the US Border Patrol; the third one is conducted among southward-bound migrants returning to Mexico from the United States; and finally, the last questionnaire is conducted among southward-bound migrants from Mexican border cities. In the first chapter I discuss the characteristics of the first three questionnaires, the variables available, as well as the advantages and disadvantages of using each section of the survey. Moreover, I discuss the possible selection biases that can occur given the survey design and how I deal with those selection issues.

International migration is a selective process, and a key prediction of economic theory is that the labor market impact of migration hinges crucially on how the skills of immigrants compare to those of natives in the host country. In the second chapter I study the selectivity of Mexican migration. I test Borjas' 1987 negative selection hypothesis which states that

individuals migrating from states with higher returns to skills and more unequal income distribution will be more negatively selected.

Using Borjas' selection model I infer worker's unobservable skills and analyze the degree of selectivity of Mexican immigrants by exploiting the variation of the degree of income inequality and returns to education across Mexican states over time. The results support Borjas' hypothesis, higher income inequality is associated with fewer years of education and lower unobservable skills. Moreover, I predict the wages in the United States of recently arrived migrants to test Borjas' predictions. The results show that higher income inequality is associated with lower observable skills. While this result is observed among workers migrating legally and illegally to the US, I do not find significant differences in the type of selectivity affecting both groups of workers.

Over the last four decades, Mexican households perceived immigration, whether temporary or permanent, to be an effective strategy for sustaining and improving their economic likelihoods. On average, between 2001 and 2010, total remittances accounted for over $20 billion dollars, representing one of the largest sources of foreign income in Mexico.

One channel through which migration may reduce poverty and promote growth is by enhancing the asset positions and productivity levels of poor households, either via remittances and savings, or human capital accumulation. Households often face significant production constraints due to absent or incomplete credit markets. Remittances and savings from work abroad, thus, may enable individuals to set up their own business upon return overcoming liquidity constraints, low initial endowments or imperfect credit markets. In addition, the skills acquired by migrants in the host countries may be put to productive use upon return.

In the third chapter I assess the impact of return migration on self-employment by exploiting the variation in return migration rates to different states of Mexico in two different periods of time. I predict return migration to different Mexican states by using past migration patterns and use these predicted rates as instruments for return migration thereby avoiding potential endogeneity issues. The results show that return migration exerted a positive impact on the probability of self-employment in Mexico between 1999 and 2010. An increase of one percentage point in the number of return migrants measured as proportion of the state population increases the probability of self-employment by 13 percentage points.

In recent years, Mexico has experienced a dramatic surge in homicides driven in large part by the violent struggle between and within powerful criminal organizations to control the lucrative drug trade business. While there is consensus that drug violence has had social, economic and political impact, little research has been devoted to study the effect of violence on the migratory patterns of Mexican workers.

Violence can affect the inflows and outflows of migrants; however, it is not clear in which direction the effects go. Violence creates a social and economic burden on societies, and impacts not only individuals or businesses, but also the larger economy. Estimates suggest that the annual cost of violence in Mexico is between 1.0 and 1.5% of GDP, it decreases foreign direct investment, domestic investment, and consumption, and can also affect individuals' earnings, job performance or the ability to keep a job.

Additionally, violence imposes significant emotional costs on individuals. Violence generates displacement; individuals tend to migrate in order to find safer environments for themselves and their families. The increase in violence could have also changed the emotional cost of being away, increasing the cost for migrants who leave their families back in Mexico who perceive their family members might be at risk; and decreasing the cost of migrants who migrate with their families to the US and now feel that Mexico is not a good place to be.

Migration costs could have also increased with violence. During the last years criminal gangs have come to control smuggling routes into the United States and migrants are frequently subjects of abuses including assault, extortion, theft, and death at the hands of those violent criminal groups.

In the last chapter of this dissertation I study the effect of drug-violence on the outflows of migrants from Mexico to the United States. I exploit the variation in violence across municipalities over the period of 2007-2011. The results show that individuals from Western and Southern Mexico are more likely to change their migratory behavior in response to changes in violence. Violence increases migration rates from Western Mexico but decreases migration rates from Southern Mexico. An increase of 1 death per 10,000 inhabitants increases migration rates from municipalities of Western Mexico by 0.06 percentage points, but decreases migration rates from Southern Mexico by 0.10 percentage points.

2.0 SURVEY OF MIGRATION TO THE NORTHERN BORDER (EMIF)

2.1 INTRODUCTION

One of challenges of studying Mexican migration and particularly undocumented migration to the United States is the lack of information. While migrants are observed in household datasets conducted in the US such as the Current Population Survey (CPS) or the US Census, those surveys do not allow us to identify migrants by legal status and are likely to undercount temporary, circular, and undocumented migrants.

In this chapter I introduce one of the most complete sources of information of Mexican migrants in the United States. The Survey of Migration to the Northern Border (EMIF) is a cross sectional survey that has been conducted seventeen times between 1993 and 2012 with the objective to measure the flows of migrants between Mexico and the United States. The EMIF's survey design is similar to the United Kingdom's International Passenger Survey, it samples travelers and distinguish visitors and immigrants[1].

EMIF's sample design is constructed by using two dimensions: space and time. Individuals are selected within a flow of people that walk through a specific location at a specific day and time. That is, an individual is surveyed at one specific hour of a specific day of a particular quarter, in a particular location point of one specific zone within a border city. The sampling framework is dynamic; rounds of data collection are conducted regularly for each quarter of a year; hence, units and weights can change given the nature of the migration flows.

The Mexican Department of Labor and Social Welfare estimates that EMIF accounts for

[1] Brownell (2010).

more than 90 percent of migrant flows between the US and Mexico[2]. It is conducted among individuals twelve years of age or older who were not born in the US and who do not live in the city in which the survey is conducted.

The EMIF consists of four different questionnaires that quantify the flows of migrants going into and out of Mexico. The first one is conducted among northward-bound migrants with destinations in either Mexican border cities or the US; the second one is conducted among migrants returned to Mexico by the US Border Patrol; the third one is conducted among southward-bound migrants returning to Mexico from the United States; and finally, the fourth questionnaire is conducted among southward-bound migrants from Mexican border cities.

In this dissertation I use information of the first three questionnaires of the EMIF. Each section contains socioeconomic characteristics of migrants such as age, years of schooling, marital status, legal status, and state of origin.

The survey conducted among individuals migrating to the US includes information of their labor market outcomes prior to migration such as employment status, wages or occupation in Mexico. Additionally the survey asks their motive to migrate and if they had previous migratory experience. Given the scope of this dissertation, I restrict the sample to include only individuals migrating to the US to work or look for a job eliminating students and tourists.

The survey conducted among migrants returning to Mexico includes information of their duration in the US, state, wages, occupation, and remittance behavior. The survey also asks their reason to return which allows to identify return migrants and temporary workers. For individuals who were caught by the Border Patrol the survey includes information of their place of apprehension and their intentions to try to re-enter the US. For all workers returning to Mexico (either voluntarily or by the Border Patrol) I restrict the sample to include only individuals who were in the US to work or look for a job.

While the EMIF is one of the most complete datasets available to study Mexican migration, the use of its different sections has to consider the possible selection biases that can occur given the survey design.

[2]Secretaria de Trabajo y Prevision Social 1999.

2.2 MIGRANTS RETURNED BY THE BORDER PATROL

2.2.1 Description, advantages and disadvantages of using this sample

This survey is conducted among workers returned to Mexico by the Border Patrol. This sample includes individuals who were caught while they were trying to enter the US (74% caught crossing the border) or when they were already in the US in their home or workplace (26%). Once individuals are returned to Mexico by the Border Patrol 66% of them decide to re-enter the US within the next few days[3]. I use this sample in the chapter "Drug Violence and Migration Flows" to estimate the effect of violence on the probability to re-enter the US.

This section of the survey provides sample weights which make the sample representative total number of migrants returned by the Border Patrol and its estimates are in line with the statistics presented by US Customs and Border Protection. The agency reported that on average during the fiscal years of 2008 to 2011 the number of apprehensions in the Southwest Border was 505,000 migrants, and according to the EMIF, during the same period of time the number of apprehensions was approximately 481,000.

2.3 NORTHWARD-BOUND MIGRANTS WITH DESTINATIONS IN EITHER MEXICAN BORDER CITIES OR THE US

2.3.1 Description, advantages and disadvantages of using this sample

In this survey I restrict the sample to include Mexican migrants with US destination with intention to work or look for a job. This sample includes migrants who will try to cross into the US; however, some of them will not succeed. While this sample is representative of the population leaving their hometowns who traveled to the US-Mexican border with intention to enter the US, it overestimates the number of migrants who will end up working in the United States. Even though the evidence show that a large proportion of workers will try

[3]If I eliminate those individuals who plan to stay in the border city for a period of time the probability of re-entry increases to 72 percent.

Table 1: Summary Statistics: Migrants Returned by the Border Patrol

EMIF: Migrants Caught by the Border Patrol 2008-2011		
Variable	Mean	Std. Dev.
Age	29.4	8.895
Years of schooling	7.89	2.885
Married	51.9%	0.500
With family in the US	36.8%	0.482
Women	15.4%	0.361
Intention to reenter to the US	65.5%	0.475
Duration in the U.S. (years)	1.78	4.425
Caught crossing at the border	71.1%	0.453
Previous migration experience	27.2%	0.445
Number of attempts to cross	1.27	0.785
State of Aprehension**		
California	38.4%	0.486
Texas	22.2%	0.416
Arizona	11.7%	0.322
Region of origin Mexico		
Western	26.2%	0.440
Southern	27.1%	0.445
Northern	23.1%	0.422
Central	23.5%	0.424
Number of observations	35,865	
Sum of weights	1,899,213	

*Individuals surveyed between 2008 and 2011.

** Individuas who were not caught crossing the border.

Table 2: Number of Apprehensions by Fiscal Year

Number of Apprehensions by Fiscal Year		
	EMIF	**Border Patrol, Southwest Border**
2008	536,089	705,005
2009	565,223	540,865
2010	449,624	447,731
2011	371,692	327,577
Average	480,657	505,295

Table 3: Proportion of migrants from different regions of Mexico

	Undocumented migrants who tried to enter between 2008-2010	Return Migrants after being apprehended by the Border Patrol 2008-2010
Western Mexico	32.8%	28.1%
Southern Mexico	27.5%	24.7%
Central Mexico	23.3%	25.3%
North Mexico	16.4%	21.9%

to enter on several occasions until they succeed, a small proportion of them will desist and will return home.

In the chapter "Drug Violence and Migration Flows" I use the number of migrants from different Mexican municipalities as a proxy for migration rates. While there is no available information regarding the probability of successfully crossing to the United States, using estimates of the probability of apprehension by the Border Patrol, the probability to try to re-enter the US after being apprehended, and the average number of times that an undocumented migrant tries to enter before he succeeds, I estimate a probability of successfully crossing of 86 percent[4].

A potential source of bias could arise if this survey systematically over or under-sample migrants by region. This could occur if the probability of returning to Mexico after a failed attempt to enter the US is different for individuals from different regions of Mexico. One way to test for differences in the rate of return is to see if the proportion of migrants from each region of Mexico who try to enter the US is different to the proportion of migrants who after being caught by the Border Patrol decide to return home. I use a sample of undocumented workers who tried to enter between 2008 and 2010 and a sample of migrants who decided to return to Mexico after being apprehended by the Border Patrol during the same period of time to see if the proportion of workers from different regions of Mexico differs for both samples. As Table 3 shows, there do not seem to be important differences by region.

In order to compare the characteristics of migrants with those of the Mexican population I use data from the 2010 Mexican census. The Mexican Census was conducted in 2.7 million Mexican households; it allows identifying possible demographic changes as well as economic

[4] Appendix 1 shows calculations.

and social. It adds valuable information at different sampling levels such as municipality, state and country as a whole. Furthermore, by following the recommendations of international institutions and following methodologies widely accepted it collects and organizes the information such that can be comparable to other countries.

Among the recommendations that are taking into account for designing the Census are the collection of individual information of all members of the sampling unit; universality, the process should cover the whole Mexican territory as well as households and people; simultaneity, the information is collected at a particular time period; periodicity, it is conducted in a regular way and time; and, sampling, all surveys conducted during the Census are applied to sampling units probabilistic selected such that the information is considered representative of all Mexican territory.

Table 4 shows summary statistics for migrants aged 16 to 65 surveyed by the EMIF between 2008 and 2011. Table 5 shows summary statistics for the Mexican population according to the 2010 Mexican Census. If we compare the characteristics of migrants and the characteristics of the Mexican population we find that migrants are slightly younger, less educated, and predominantly males. With respect to labor market outcomes, migrants are more likely to be in the labor force, but also more likely to be unemployed prior to migration. Migrants tend to be disproportionally from Western and Southern Mexico. In this sample 86 percent of the migrants surveyed are undocumented. This estimate is in line with the calculations presented by the Pew Hispanic Center[5].

Next, in order to analyze composition of Mexican migrants according to the state of origin, and to verify if there exist differences with respect to migrants found in different datasets I use a sample of return migrants surveyed by the Mexican Census.

The Census asks respondents two relevant questions. The first one is where they had been living five years before the census was taken which allows me to estimate the number of migrants who returned to Mexico during that period of time. Additionally, in order to estimate the number of migrants who migrated recently the census asks whether anyone from the household had left for another country during the previous five years. If so, additional

[5] According to Passel (2006) in the early 2000's about 80 to 85 percent of the immigrants coming from Mexico entered the U.S. undocumented.

Table 4: Summary Statistics EMIF: Northward-bound migrants with U.S. destination

EMIF: Northward-bound migrants with U.S. 2008-2011		
Variable	Mean	Std. Dev.
Age	33.7	12.274
Years of schooling	7.57	3.507
Married	62.6%	0.484
Women	16.8%	0.374
Speak english	16.2%	0.369
Undocumented	86.0%	0.347
Travel with family members	29.6%	0.457
Labor force	73.0%	0.444
Unemployed	7.9%	0.270
Smmugler	36.1%	0.480
Migratory experience	21.4%	0.410
State of Destination in U.S.		
California	37.9%	0.485
Texas	11.4%	0.318
Arizona	9.7%	0.296
Florida	2.9%	0.167
Region of origin Mexico		
Western	35.9%	0.480
Southern	26.0%	0.439
Central	22.8%	0.419
Northern	15.3%	0.360
Number of observations	35,401	
Sum of weights	1,900,197	

*Individuals surveyed between 2008 and 2011 age 16 to 65.

questions are asked about whether and when that person or persons came back.

Between 2005 and 2010, 1.4 million people returned to Mexico, or 1.3 percent of the total population of 2010. We can group return migrants into different categories. The first and largest group is Mexican born adults who lived in the US five years before and in Mexico in the census date (812,000 individuals). The second group is US born who were in the US five years before the census and were back in Mexico at the time of the Census (153,000 individuals, largely children). The third one consists of children under 5 born in the US and in Mexico at the time of the census (203,000 children). Finally, the last group includes recent migrants, who were in Mexico five years before the census, were in Mexico at the time of the census, but during that period migrated to the US and returned (205,000 individuals).

If the objective is to compare state of origin of migrants surveyed by the EMIF I need to focus on the first group of return migrants, the Mexican adults who were living in the US in 2005 and were back in Mexico in 2010. The second and third categories include mainly children, and the fourth category, given the structure of the census, we know the number of individuals but we do not have information of their individual characteristics and labor market outcomes.

Table 6 shows the distribution by state of origin of the return migrants who were in the United States in 2005 and in Mexico in 2010 according to the Mexican Census. Additionally, Table 6 shows the distribution of individuals who migrated and were surveyed by the EMIF (Northward-bound survey) between 1999 and 2005.

Even though by construction these two samples of workers are not identical, the census is the only other dataset that allows to study immigrants' state of origin. The correlation estimated between both distributions is 0.74. While this correlation does not seem very high, it does not represent a concern since the Mexican Census only identifies migrants who returned to Mexico and misses all those who are still in the U.S. at the time of the survey. As has been shown in the literature, return migration is not a random process, a factor that could explain the differences found in those distributions.

If I want to compare the characteristics of the migrants found in the Mexican census a better comparison group would be a sample of return migrants who were in the US in 2005 and in Mexico in 2010. I can find migrants with those characteristics using the Southward-

Table 5: Summary Statistics: 2010 Mexican Census

Mexican Census 2010		
Age	34.8	13.303
Years of schooling	8.55	4.521
Married	62.2%	0.485
Women	47.8%	0.500
Labor force	59.5%	0.491
Unemployed	1.9%	0.137
Region of origin Mexico		
Western	18.6%	0.389
Southern	22.4%	0.417
Central	36.7%	0.482
Northern	22.3%	0.417
Number of observations	2,500,000	
Sum of weights	127,482,701	

*Individuals age 16 to 65.

bound sample from the EMIF. This subsample is conducted among individuals entering Mexico and allows us to identify return migrants. In section 2.4 I introduce the new dataset. In section 2.4.1 I compare the characteristics of the return migrants surveyed by the EMIF and the Mexican census including state of origin (Mexico) and state of destination (US). As I show in section 2.4.1 those samples of workers have similar characteristics, and therefore, will have higher correlation rates.

2.4 SOUTHWARD-BOUND MIGRANTS RETURNING TO MEXICO FROM THE UNITED STATES

2.4.1 Description, advantages and disadvantages of using this sample

This survey is conducted among individuals traveling to Mexico from the US by their own free will. The sample includes individuals visiting Mexico for a short period of time, and return migrants, who are workers returning to Mexico to settle there permanently and have no intention to return to the United States.

Table 7 shows summary statistics. The migrants represented in this section of the EMIF have different characteristics to those observed in the previous surveys. They are older, have been on average 11 years in the US, and 77 percent of them had a job in the US. In

Table 6: Distribution by Mexican State: Mexican Census and EMIF Northward-bound survey

	Mexican 2010 Census	EMIF Northern Survey
	Migrants who were in the US in 2005	Migrants who entered the US between 1999-2005
Jalisco	9%	7%
Michoacán	8%	12%
Guanajuato	7%	14%
Veracruz	6%	5%
México	6%	3%
Puebla	5%	3%
Oaxaca	4%	5%
Chihuahua	4%	1%
Guerrero	4%	4%
Hidalgo	4%	2%
Tamaulipas	3%	1%
Sonora	3%	7%
Zacatecas	3%	3%
San Luis	3%	3%
Durango	2%	2%
Sinaloa	2%	4%
Morelos	2%	1%
Distrito Federal	2%	2%
Nayarit	2%	2%
Nuevo León	2%	2%
Other States	17%	16%
Correlation	74%	

Table 7: Summary Statistics: Southward-bound migrants returning to Mexico from the United States

EMIF: Southward-bound migrants returning to Mexico from the United States				
Variable	All Migrants		Return Migrants	
	Mean	Std. Dev.	Mean	Std. Dev.
Age	40.16	13.489	40.36	15.497
Years of schooling	8.28	3.669	8.15	3.961
Married	71.6%	0.451	63.9%	0.480
Women	26.5%	0.441	33.3%	0.471
With family in US	84.0%	0.367	80.5%	0.396
Undocumented	39.4%	0.489	67.0%	0.470
Return Migrant	31.5%	0.464	100.0%	0.000
Duration in U.S. (in years)	11.28	12.509	5.77	10.790
Work in U.S.	77.4%	0.418	70.2%	0.457
Remmitance sender	34.0%	0.474	32.9%	0.470
Region of origin Mexico				
Western	37.8%	0.485	39.2%	0.488
Southern	11.3%	0.316	13.6%	0.343
Central	17.1%	0.377	21.4%	0.410
Northern	33.8%	0.473	25.8%	0.438
State of Destination in U.S.				
California	35.1%	0.477	38.7%	0.487
Texas	31.0%	0.462	29.6%	0.457
Arizona	11.7%	0.322	10.4%	0.306
Number of observations	30,740		9,624	
Sum of weights	3,996,453		1,257,478	

*Individuals surveyed between 2008 and 2011.

this sample we observe that 39 percent of the migrants are undocumented, 31.5 percent are return migrants and 34 percent are remittance senders. The last columns of Table 7 show the characteristics of return migrants. They are more likely to be undocumented and they have been in the US on average 5.8 years.

While this survey provides valuable information, it is not representative of the Mexican population living in the United States. The main reason is that the sample includes only immigrants who returned to Mexico, and misses those who settled in the US and never returned. For that reason this survey has to be used with caution. In the next section I will analyze how the characteristics of Mexican workers surveyed by the EMIF mirror those of workers found in the literature using other datasets.

Additionally, a selection issue can arise if workers with different characteristics are more or less likely to cross the Mexico-US border, since they might appear in the sample at different rates.[6] In order to address this problem, using the number of times that each worker has

[6]For example, illegal workers might be more likely to cross back and forth if they earn high wages and can pay a smuggler, or if they earn low wages in the U.S. and have a low opportunity cost of being caught.

entered and exited the US, I estimate their probability of being observed in the sample and construct a set of weights using the inverse of that probability[7].

While this survey might not be representative of the Mexican population living in the United States, it can be used to accurately estimate the number of Mexican return migrants. The number of return migrants estimated using the EMIF is in line with the number of return migrants estimated using other datasets such as Mexican censuses.

Table 8 shows the distribution by state of destination in the United States of the migrants who returned to Mexico between 2007 and 2010 and were in the US in 2005 surveyed by the EMIF. Additionally, Table 8 shows the distribution of all Mexican immigrants who were in the United States in 2005 according to the American Community Survey. Even though by construction these two samples of workers are not identical; we can observe that the distributions by state in the US are similar. The correlation between both distributions is 98 percent.

The second panel of Table 8 shows the distribution of the state of origin of return migrants from the Mexican census and from the EMIF. While by construction there exist some differences in the two groups of migrants (e.g. The Mexican Census includes individuals who return to Mexico after being studying in the US and they are not included in the EMIF), the correlation in the distribution of the state of origin is high (85 percent[8]).

One interesting feature of the EMIF is that it reports information of wages and occupation in the United States, and for return migrants, it also includes the sector of the economy in which the migrant expects to work. This provides valuable information regarding the labor market outcomes of return migrants. As Table 9 shows, return migrants report that individuals in the commerce, agricultural and manufacturing sector are more likely to work in the same sectors upon return. Individuals who worked in the US as professional/technicians and services are more likely to work in the manufacturing sector.

[7]First, I estimate the number of entries per year for each migrant. Then, I estimate the probability of being observed in the sample using the number of entries per year for each individual divided by the total number of entries per year according to the EMIF. Sample weights are the inverse of the probability of being observed.

[8]Given that the EMIF do not survey individuals who live in border cities the correlation is calculated excluding those states.

Table 8: Distribution by State in U.S. and State of Origin in Mexico of Return Migrants from EMIF

	EMIF	2005 American Community Survey		EMIF	Mexican 2010 Census
	Immigrants in US in 2005 who returned between 2007-2010	Mexican immigrants in the US in 2005		Immigrants in US in 2005 who returned between 2007-2010	Immigrants in the US in 2005
California	51%	39%	Guanajuato	13%	7%
Texas	20%	20%	Michoacán	11%	8%
Arizona	7%	5%	Veracruz	7%	6%
Florida	2%	3%	Jalisco	7%	9%
Illinois	2%	7%	San Luis Potosi	6%	3%
Colorado	2%	2%	Oaxaca	5%	4%
Nevada	1%	2%	México	4%	6%
New Mexico	1%	1%	Guerrero	4%	4%
Georgia	1%	2%	Distrito	4%	2%
North Carolina	1%	2%	Hidalgo	3%	4%
Oregon	1%	1%	Zacatecas	3%	3%
New Jersey	0%	1%	Chiapas	3%	1%
Virginia	0%	2%	Sinaloa	3%	2%
New York	0%	2%	Puebla	2%	5%
Indiana	0%	1%	Querétaro	2%	2%
Other States	10%	10%	Other States	25%	34%
Correlation	98%		Correlation	85%	

Table 9: Return Migrants: Activity in the U.S. and expected activity upon return

		Activity in Mexico upon Return				
		Commerce	Services	Agriculture	Manufacturing	Others
Activity in the US	Professional	31.6%	13.1%	3.9%	43.8%	7.6%
	Commerce	45.9%	16.7%	15.0%	12.4%	10.0%
	Services	14.8%	25.3%	26.1%	27.2%	6.6%
	Agriculture	6.5%	8.6%	60.9%	17.0%	7.0%
	Manufacturing	21.6%	24.1%	13.4%	33.4%	7.6%
	Others	40.8%	28.4%	14.6%	9.4%	6.8%

2.4.2 Return Migration: EMIF and Mexican census data

I analyze how the characteristics of the return migrants observed in the EMIF compares to those of return migrants captured by other datasets. I choose the 2010 Mexican Census to conduct the analysis for several reasons. First, as it has been pointed out by different authors[9], from all the different datasets that include return migrants and identifies them, the 2010 Mexican Census provides questions that can be used to make an accurate estimation of their number.

In order to compare the census data I select all return migrants from the EMIF who migrated and returned to Mexico during the same period of time. The results are shown in Tables 10 and 11. The Census reports 811,725 return migrants and the EMIF reports 806,267. The results also show some differences across samples. According to the census, return migrants are on average younger and more educated. The proportion of women is higher, and 11.4 percent of the respondents report to work in professional activities.

One reason that could explain the different characteristics observed is that the EMIF tends to underestimate the number of individuals who studied in the US and returned to Mexico. When I look at the proportion of return migrants with more than sixteen years of schooling (with Masters or Ph.D. degrees) the EMIF captures less than fifty percent of those observed in the Census. It is important to note that those individuals represent a small share of the total number of return migrants. According to the census 4 percent of the return migrants have more than 16 years of schooling and only 2 percent according to the EMIF. Unfortunately, the census does not provide information on the reason to migrate to the United States, therefore we cannot differentiate between individuals who migrate with intention to work in the US.

For those reasons, the EMIF becomes the best source of information about return migration given that my objective is to study the effects of migration to the United States to work or look for a job. This dataset is used in the chapter "Testing Borjas' Negative Selection Hypothesis among Mexican Immigrants in the United States" and in the chapter "Return Migration and Self-Employment in Mexico. In the latest I further restrict the sample to only

[9] Passel, Cohn and Gonzalez-Barrera (2012).

include return migrants who actually worked in the United States.

2.4.3 Survey of Migration to the Northern Border (EMIF) and Current Population Survey (CPS)

I examine how the characteristics of Mexican workers surveyed by the EMIF mirror those of workers found in the literature using other datasets. I use information from the CPS available since 1994. I compare the characteristics of Mexican workers from the CPS with those of legal workers settled permanently in the US from the EMIF and find no significant differences in their education and wages. These results suggest that, even though the EMIF only includes Mexican workers who returned to Mexico and misses the workers who never returned, the characteristics of legal permanent workers observed in the EMIF are similar to those of the workers survey by the CPS, a survey that includes a representative sample of the Mexican workers permanently settled in the United States.

Figure 1 shows average hourly earnings for different cohorts of Mexican male migrants from the CPS, and Figure 2 shows average hourly earnings of workers from the EMIF. When we compare all workers from both surveys (Figures 1 and 2) we can observe similar trends in their wages, however, the wages from the EMIF are lower for all cohorts of entry.

Given that the likelihood of observing illegal and temporary workers is lower in the CPS than in the EMIF, and that those groups of workers are the ones more likely to earn lower wages, I also compare the trends on the wages observed from the CPS with the wages of legal workers settled permanently in the US from the EMIF (Figure 3). Now there are not differences in the wages of workers who entered before 1990, and for the two most recent cohorts, the wages from the EMIF are even higher than those observed from the CPS. These results suggest that, even though the EMIF only includes Mexican workers who return to Mexico and misses the workers who never return, the wages of legal permanent workers observed in the EMIF are similar to those of the workers survey by the CPS, a survey that includes a representative sample of the Mexican workers permanently settled in the US. These results were replicated for different age categories obtaining similar results.

Table 10: Summary Statistics: Return Migrants from 2010 Mexican Census

2010 Mexican Census Return Migrants between 2005 and 2010		
	Mean	**Std. Dev.**
Age	34.48	10.56
Years of Schooling	8.73	3.80
Married	70.0%	0.46
Women	28.1%	0.45
Labor Market Outome in Mexico (upon return)		
Self-employed	19.9%	0.40
Wage-worker	42.1%	0.49
Unemployed	5.9%	0.24
Labor force	72.1%	0.45
Hourly wage (in dollars)	2.79	6.38
Economic Sector*		
Industry	31.3%	0.46
Agricultural	23.6%	0.42
Services	17.6%	0.38
Commerce	15.4%	0.36
Professional	11.4%	0.32
Other	0.7%	0.08
Region of origin Mexico		
Western	31.9%	0.47
Southern	18.0%	0.38
Central	23.5%	0.42
Northern	26.6%	0.44
Number of observations	20,630	
Sum of weights	811,725	

*Includes employed return migrants.

Individuals who migrated before July of 2005 and returned between July of 2005 and June of 2010.

Table 11: Summary Statistics: Return Migrants EMIF

EMIF: Southward-bound migrants Return Migrants between 2005 and 2010		
Variable	**Mean**	**Std.Dev.**
Age	39.13	13.80
Years of Schooling	7.41	3.622
Married	68.2%	0.466
Women	18.3%	0.387
With family in the U.S.	86.0%	0.347
Undocumented	55.6%	0.497
Duration in the U.S. (in years)	3.06	4.282
Work in U.S.	0.77	0.420
State of Destination in U.S.		
California	50.3%	0.500
Texas	18.8%	0.391
Arizona	5.9%	0.236
Region of origin Mexico		
Western	46.7%	0.499
Southern	21.7%	0.412
Central	15.0%	0.357
Northern	16.6%	0.372
Economic Sector (Mexico)*		
Industry	23.0%	0.421
Agricultural	21.0%	0.407
Services	17.4%	0.379
Commerce	16.3%	0.369
Other	6.1%	0.239
Number of observations	5,344	
Sum of weights	806,267	

*Includes return migrants with intention to work in Mexico.

Individuals who migrated before July of 2005 and returned between July of 2005 and June of 2010.

Figure 1: Wages of Mexican Workers by Year of Arrival CPS 1994-2005

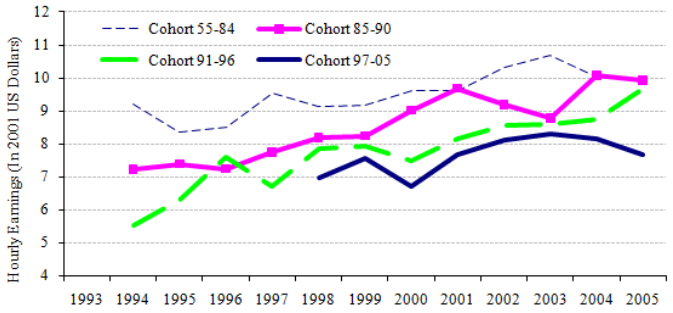


Figure 2: Wages of Immigrants by Year of Arrival EMIF 1993-2005

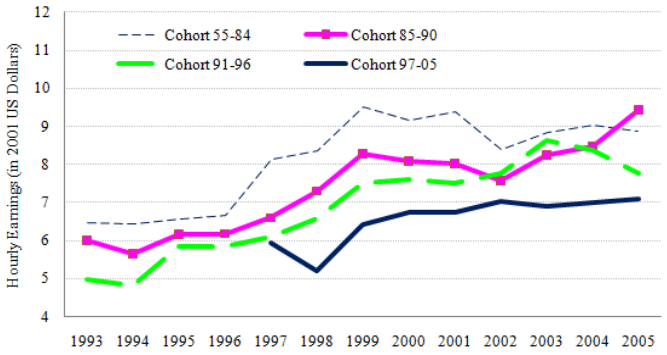
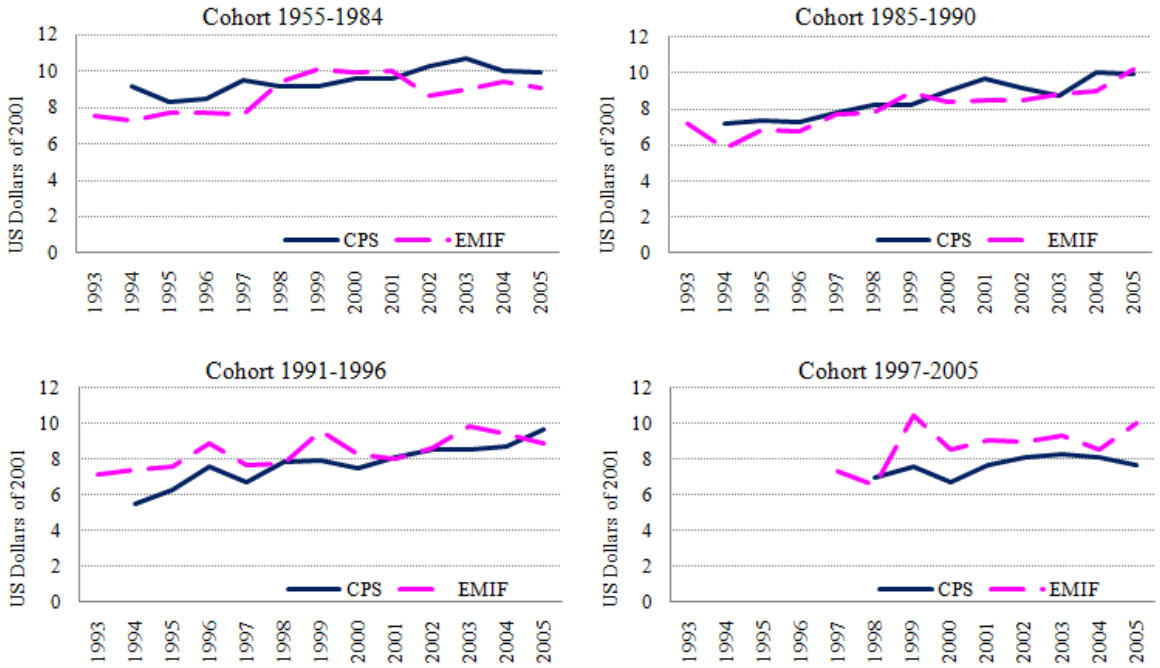


Figure 3: Wages by Cohort of Entry (CPS) vs Legal Permanent Migrants (EMIF)



3.0 TESTING BORJAS' NEGATIVE SELECTION HYPOTHESIS AMONG MEXICAN IMMIGRANTS IN THE UNITED STATES

3.1 MOTIVATION

International migration is a selective process, and a key prediction of economic theory is that the labor market impact of immigration hinges crucially on how the skills of immigrants compare to those of natives in the host country.

Borjas (1987) provides a theoretical and empirical framework that specifies conditions under which immigrants could be either positively or negatively selected. According to his model, individuals with the greatest incentive to migrate to the United States from countries with high returns to education and relatively high dispersion of wages will tend to be those with below-average skill levels in their home countries (negatively selected). On the other hand, the immigrants who find it profitable to migrate from countries where returns to education and wage dispersion are relatively low will tend to be individuals with above-average skills (positively selected). Borjas (1987) analyzes empirically the differences in earnings of immigrants from 41 countries and studies the relationship between income inequality in their countries of origin and their earnings in the United States. He finds that immigrants with high incomes in the United States relative to their measured skills come from countries that have high levels of GNP, low levels of income inequality and politically competitive systems.

While most of the research on selectivity of immigrants has studied the earnings of immigrants in the United States, I study the selectivity of immigrants but using evidence from a source country. In this paper I study the selectivity of Mexican immigrants in the

United States. Mexico is the largest source of immigrants for the United States, today 58% of the undocumented population in the United States is of Mexican origin (6.5 millions), and 30% of the total foreign born population (11.5 millions)[1].

In this paper I test Borjas' 1987 negative selection hypothesis which states that individuals migrating from states with more unequal income distribution, with high returns to education and relatively high dispersion of wages will be more negatively selected. I exploit the variation of the degree of income inequality and returns to education across states in Mexico and over time to test for differences in the type of selectivity observed among legal and illegal immigrants. First, I analyze selectivity in terms of years of schooling. Then, using Borjas' selection model I infer worker's unobservable skills and analyze the degree of selectivity based on observable and unobservable skills. Moreover, I predict the wages in the United States of recently arrived Mexican migrants to test Borjas' predictions. I control for migration costs and the size of immigrants' social networks, two important factors likely to influence immigrants' selectivity.

I use data of Mexican immigrants from the Survey of Migration to the Northern Border (EMIF). This survey was conducted between 1995 and 2005, it provides information of wages prior to migration and wages earned in the United States, identifies immigrants by legal status, and is conducted between temporary and permanent immigrants. The use of this survey allows me to overcome a number of shortcomings observed in previous studies due in large measure to the limitations of the census data that has been the principal data source for research on the selectivity of immigrants. First, I study selectivity using earnings prior to migration and earnings in the United States. Previous studies only used earnings of new immigrants in the United States which confound both, skill selectivity and initial skill transferability. Second, I identify workers by legal status. Immigrants' participation in the US labor market is subject to different constraints depending on visa status. Census data do not provide information of the individual's legal status, making it difficult to draw inferences about the skill selectivity of workers. Third, the dataset used in this paper is conducted among workers temporarily and permanently settled in the United States. If

[1] Pew Hispanic Center (2011). "Statistical Portraits of the Hispanic and Foreign-Born Populations in the U.S.

return migration is not accounted for, due to the selectivity of emigration, the comparison of an aggregate immigrant cohort in two time periods confounds the skill transferability of an individual over time and changes in the skill composition of immigrants.

When I study years of education, while aggregate analysis find evidence of positive, intermediate and negative selection in different periods of time, once we control for compositional effects we find evidence of negative selection of Mexican migrants at the state and region level over the period of analysis.

When I study earnings prior to migration I find evidence of negative selection of Mexican immigrants in terms of unobservable skills. Higher income inequality in the state of origin in Mexico is associated with lower unobservable skills. Finally, when I study earnings in the United States the results also support Borjas' prediction. Higher income inequality is associated with lower observable skills of workers migrating legally and illegally to the US. Even though the results show that both groups of workers behave according to Borjas' hypothesis, the evidence shows that there are no significant differences in the degree of selectivity affecting both groups of workers.

3.2 LITERATURE REVIEW

Scholars have disagreed considerably about how immigrants compare to individuals who stay at their origin country. Human capital models of migration claim that those who choose to leave a country might be more able and/or more motivated than those who choose to stay in their home country (Chiswick, 2000, Portes and Rumbaut, 1996). Thus, poor and uneducated individuals, due to lack of awareness or means, are less likely to migrate than those who have some education or have learned of the better conditions of living available to migrants. Another argument is that migration involves cost either economic, or emotional or both. These obstacles contribute for a high selection given that individuals who are in the lowest tail of income distribution seldom could afford these costs (Lee, 1966; Schultz, 1984). Finally, social networks made by earlier waves of immigrants can also affect the degree of selectivity by decreasing the economic and emotional costs of migration for potential new

immigrants. These lower costs can incentive less skilled individuals to migrate (Massey 1987, 1999).

Borjas (1987) by formalizing and extending Roy's model (1951) specifies conditions under which immigrants could be either positively or negatively selected. His model predicts negative selection of immigrants from countries with a great dispersion in income to countries with a more egalitarian income distribution, whereas positive selection will exist in the opposite case. Borjas argues that skilled Mexicans do not migrate to the US, since their skills could be well-paid in their country compared with unskilled Mexican workers. Thus, unskilled Mexicans facing disadvantages in Mexico are more likely to migrate. Borjas (1987) also analyzes empirically the differences in earnings of immigrants from 41 countries using the 1970 and 1980 US censuses. He studies the relationship between income inequality in their countries of origin and their earnings in the United States. He finds that immigrants with high incomes in the United States relative to their measured skills come from countries that have high levels of GNP, low levels of income inequality and politically competitive systems.

Relative to the selectivity of Mexican workers most of the research has been devoted to measure the relative skills of Mexican immigrants in the United States and the empirical evidence has shown ambiguous results. Chiquiar and Hanson (2005) find evidence of intermediate or positive selection in terms of education and observed skills using data from the 1990 Mexican and US censuses. They modify Borjas' model by changing the assumption of constant migration costs across individuals allowing migration cost to vary by individual and to decrease with years of schooling. They find that Mexican immigrants, while much less educated than US natives, were on average more educated than residents of Mexico. Moreover, they find that in 1990, if Mexican immigrants in the United States were to be paid according to current skill prices in Mexico, they would tend to occupy the middle and upper portions of Mexico's wage distribution. Similarly, Orrenius and Zavodny (2005) find evidence of intermediate selection in terms of education but using data from the Mexican Migration Project, a survey conducted in states of Western Mexico between 1987 and 1997.

On the other hand, Ibarraran and Lubotsky (2007) find evidence of negative selection

in terms of years schooling using data from the 2000 Mexican and US censuses. Fernandez-Huertas (2011) finds evidence of intermediate to negative selection in terms of schooling and wages using data from the Quarterly Employment Survey (ENET). McKenzie and Rapaport (2010) using the 1997 National Survey of the Demographic Dynamics (ENADID) find positive and negative selection for Mexican immigrants coming from high and low migration rate communities respectively, and finally, Kaestner and Malamud (2010) using data from the Mexican Family Life Survey (MxFLS) find no selection in terms of observed and unobserved skills once they control for migration cost. It has been argued in the immigration literature that the lack of consensus relative to the type of selectivity affecting Mexican immigrants can be associated to the assumptions used to adjust the size of the illegal population present in the different datasets, to differences in the period of analysis covered by different studies, and finally, to the selectivity associated with return migration if the samples of immigrants do not include temporary and permanent immigrants.

3.3 DATA

The analysis uses data from the 1990 and 2000 Mexican censuses, the 1995 Population and Dwelling Count, and the Southward-bound sample of the EMIF that includes migrants returning to Mexico from the US.

In order to avoid problems associated with selective return migration, I restrict the sample to include only workers who migrated to the US between 1990 and 2005[2]. Moreover, I limit my analysis to individuals who were working prior to migration, reported their wages in Mexico, and who worked in the US for at least one month.

Table 12 shows descriptive statistics. Immigrants have on average 6.4 years of schooling, were on average 23 years old at the time of entry, and 11.5 percent entered legally to the United States. With respect to their occupation in Mexico, they were working mainly in the production and agricultural sectors, and were earning on average 12.25 pesos per hour

[2]Even though the survey includes immigrants who migrated to the United States between 1950 and 2005, I restrict the sample to include only workers who migrated between 1990 and 2005. Including immigrants who entered prior that period could potentially bias the results if return migrants are not randomly selected. In the survey workers who returned to Mexico between 1950 and 1990 are not represented.

Table 12: Summary Statistics Immigrants Surveyed by the EMIF: Subsample of Individuals who were Working prior Migration

	Mean	Standard Deviation	Minimum	Maximum
Years of schooling	6.37	3.379	0	22
Married	65.0%	0.477	0	1
Age of arrival	23.43	8.303	0	70
Legal at entry	11.5%	0.320	0	1
Year of entry	1999	3.722	1990	2005
Experience in Mexico	10.63	8.205	0	58
Occupation in Mexico				
Professional/technician	4.4%	0.206	0	1
Services	5.7%	0.232	0	1
Commerce	11.2%	0.315	0	1
Agriculture	37.5%	0.484	0	1
Production	38.7%	0.487	0	1
Other activities	2.5%	0.155	0	1
Real hourly wage (pesos of 2001)	12.25	13.31	0.5	217.4
Region of origin in Mexico				
North	25.6%	0.437	0	1
South	29.1%	0.454	0	1
Western	45.3%	0.498	0	1
State of destination US				
California	41.3%	0.492	0	1
Texas	13.2%	0.338	0	1
Arizona	10.6%	0.308	0	1
Colorado	8.2%	0.274	0	1
Washington	3.4%	0.181	0	1
Immigrants' Networks*				
North	3.1%	0.016	0.00	0.08
South	2.3%	0.012	0.00	0.05
Western	6.6%	0.019	0.03	0.10
Distance**				
North	0.98	0.507	0.12	2.84
South	2.00	0.514	0.64	3.53
Western	1.69	0.465	0.56	2.81
Observations	4,828			

*The size of the network is proxied by the number of workers who migrated in the previous five years from each state as a proportion of the total population of that state.

** Distance in thousand miles from the capital of the state of origin in Mexico to the city of destination in the U.S.

Table 13: Summary Statistics Immigrants Surveyed by the EMIF: Sample of workers Employed and Unemployed prior Migration

	Mean	Standard Deviation	Minimum	Maximum
Years of schooling	7.56	3.616	0	22
Married	66.1%	0.473	0	1
Age of arrival	26.05	8.867	12	63
Legal at entry	43.9%	0.496	0	1
Year of entry	1996	3.995	1990	2005
Experience in U.S.	18.56	10.582	1	52
Occupation in U.S.				
Professional/technician	5.6%	0.229	0	1
Services	3.1%	0.173	0	1
Commerce	19.9%	0.399	0	1
Agriculture	22.2%	0.415	0	1
Production	49.2%	0.500	0	1
Other activities	0.1%	0.033	0	1
Real hourly wage (dollars 2001)	7.38	4.94	0	115
Region of origin in Mexico				
North	38.2%	0.486	0	1
South	22.3%	0.416	0	1
Western	39.5%	0.489	0	1
State of destination in U.S.				
California	35.1%	0.477	0	1
Texas	17.1%	0.376	0	1
Arizona	17.1%	0.377	0	1
Colorado	7.2%	0.259	0	1
New Mexico	4.0%	0.195	0	1
Immigrants' Networks*				
North	3.1%	0.018	0.0	0.1
South	2.2%	0.013	0.0	0.0
Western	6.3%	0.019	0.0	0.1
Distance**				
North	0.85	0.516	0.12	2.84
South	1.95	0.555	0.69	3.45
Western	1.60	0.485	0.45	3.47
Observations	8,906			

*The size of the network is proxied by the number of workers who migrated in the previous five years from each state as a proportion of the total population of that state.
** Distance in thousand miles from the capital of the state of origin in Mexico to the city of destination in the U.S.

Figure 4: Average Earnings and Gini Coefficients by State in Mexico (1990)

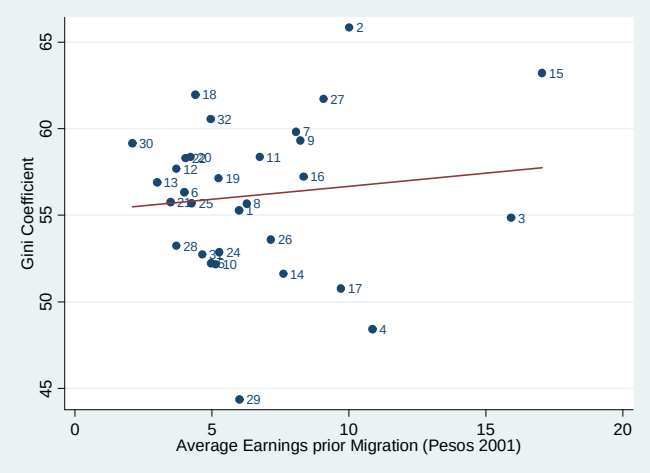


Figure 5: Average Earnings and Gini Coefficients by State in Mexico (1995)

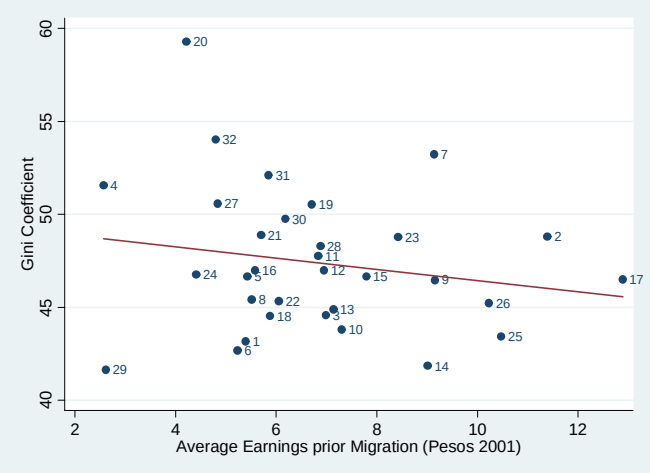
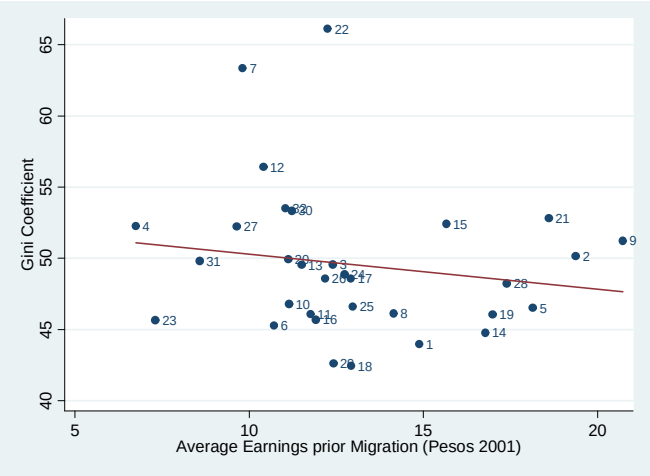


Figure 6: Average Earnings and Gini Coefficients by State in Mexico (2000)



(in pesos of 2001). It is interesting to note that the largest proportion comes from states of Western Mexico (45.3%), followed by states of Southern Mexico (29.1%), and finally from states of Northern Mexico (25.6 %). With respect to states of destination, the larger proportion of immigrants is working in California, followed by the states of Texas, Arizona and Colorado.

As proxy for migration costs I use the distance in miles from the capital of the state of origin in Mexico to the city of destination in the United States. For workers migrating from states of northern Mexico the average distance is 980 miles, for those migrating from western Mexico is 1,690 miles, and finally, for immigrants from states of southern Mexico the average distance is 2,000 miles. In order to control for the size of immigrant network in the United States I use information from the National Population Council of Mexico. As a proxy for the size of the immigrant network that workers migrating from different states of Mexico can find when they arrive to the United States I use the number of workers who migrated from each Mexican state during the previous five years as proportion of the current total population of that state. Table 12 shows that the size of the immigrant network is larger for workers from states of Western Mexico, states that are historically the most important sending immigrants (6.6%), followed by that of workers from Northern Mexico (3.1%), and finally for workers from states of Southern Mexico (2.3%).

Migrants were grouped by year of arrival into 3 categories. For individuals who migrated between 1990 and 1992 their year of reference is 1990, for those who entered between 1993 and 1997 their year of reference is 1995, and for those who entered between 1998 and 2005 their year of reference is 2000. Figures 4 to 6 show the Gini coefficient for Mexican states and immigrants' earnings prior to migration for years 1990, 1995 and 2000. The figures show that without controlling for workers' characteristics, there seems to be a positive relationship between the income inequality in the state of origin (a Gini coefficient closes to 1 implies higher inequality) and the earnings of immigrants in 1990, but a negative relationship in years 1995 and 2000.

In order to estimate the selectivity of immigrants by using wages in the United States I use a different sample of workers. The new sample includes more observations since now I eliminate the restriction of working prior to migration. It includes all workers who migrated to the United States between 1990 and 2005, who stayed in the US at least six months, worked in the US and reported their earnings. Table 13 shows descriptive statistics for the second sample of immigrants. Finally, when I study selectivity of education the sample is the largest since all the restrictions are eliminated.

3.4 SELECTIVITY IN TERMS OF OBSERVABLE SKILLS

3.4.1 Model

In this section the objective is to test for selectivity in terms of education. I use for the analysis a simple two country model of migration similar to the one presented by Hanson and Chiquiar (2005)[3]. In this model there are two countries, the home country (Mexico) that will be identified as country 0, and the host country (United States) that will be identified as country 1. In the model residents of Mexico have the following wage equation:

$$\ln w_0 = \mu_0 + \delta_0 s \tag{3.1}$$

[3]In this model I assume constant migration costs and Hanson and Chiquiar assume that migration costs decrease with years of schooling.

where w_0 is the wage in Mexico, μ_0 is the base wage in Mexico, δ_0 represents the returns to education in Mexico, and finally s is a random variable that represents years of schooling. Similarly, the wage equation for the US is given by

$$\ln w_1 = \mu_1 + \delta_1 s \tag{3.2}$$

where w_1 is the wage in the US, μ_1 is the base wage for a Mexican migrant in the US, and δ_1 represents the returns to education in that country.

With respect to migration costs we assume that migrants face constant migration cost equal to C and π gives a time-equivalent measure of the costs of migrating to the United States ($\pi = C/w_0$ migration costs in terms of income in Mexico).

Using the previous expressions an individual will migrate if

$$I = \ln(w_1/(w_0 + C)) \approx (\mu_1 - \mu_0 - \pi) + (\delta_1 - \delta_0)\, s. \tag{3.3}$$

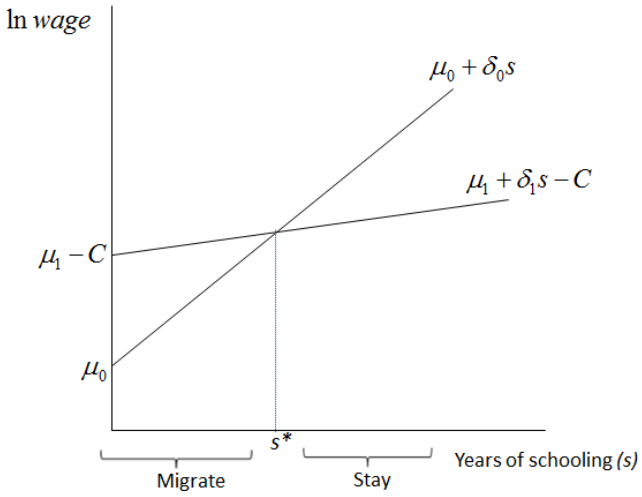
Figure 7 shows who will find it optimal to migrate; we assume that $\delta_0 > \delta_1$ which implies higher returns to education in Mexico than in the US. The figure shows that individuals with schooling less than s* migrate and individuals with more than s* years of education will stay in Mexico. In other words, since returns to education are higher in Mexico, individuals with relatively high levels of education will not find profitable to migrate.

In this section first I show how years of schooling of Mexican immigrants have changed over time. Then, I estimate the returns to education in Mexico and the United States, and finally, test for differences in the selectivity of workers on years of schooling by looking at the returns to education in different Mexican states. According to this model, if a state has higher returns to education should expect that migrants from that state should have less years of education than migrants from a state with lower returns to education.

3.4.2 Estimating Returns to Education

One of the assumptions used in the model presented in the previous section is the existence of higher returns to education in Mexico than in the United States (■$_0 >$ ■$_1$). In this section I verify the validity of this assumption using data from the 1990 and 2000 Mexican census,

Figure 7: Selectivity of Migration in terms of Years of Schooling



and the 1995 Population and Dwelling Count. Table 14 shows regression results. In column 1 the dependent variable is the logarithm of the wage in Mexico for all Mexican residents. In column 2 the dependent variable is the logarithm of the wage in the United States using data of all Mexican migrants surveyed by the EMIF who migrated between 1990 and 2005. The results show that returns to education are significantly higher in Mexico than in the United States for all educational attainments. These results are in line with the findings presented by Hanson and Chiquiar (2005).

3.4.3 Years of Schooling of Mexican immigrants over time

In this section I describe how years of schooling of Mexican immigrants compare to those of workers who did not migrate. Figure 8 shows the educational attainment for the Mexican population and for the sample of immigrants. It shows that on average, immigrants tend to be positively selected during the early 1990's. Immigrants are drawn from the higher tail of the educational distribution. In 1990 while 68% of the Mexican population had more than 5 years of schooling, 82% of the immigrant population had that educational attainment.

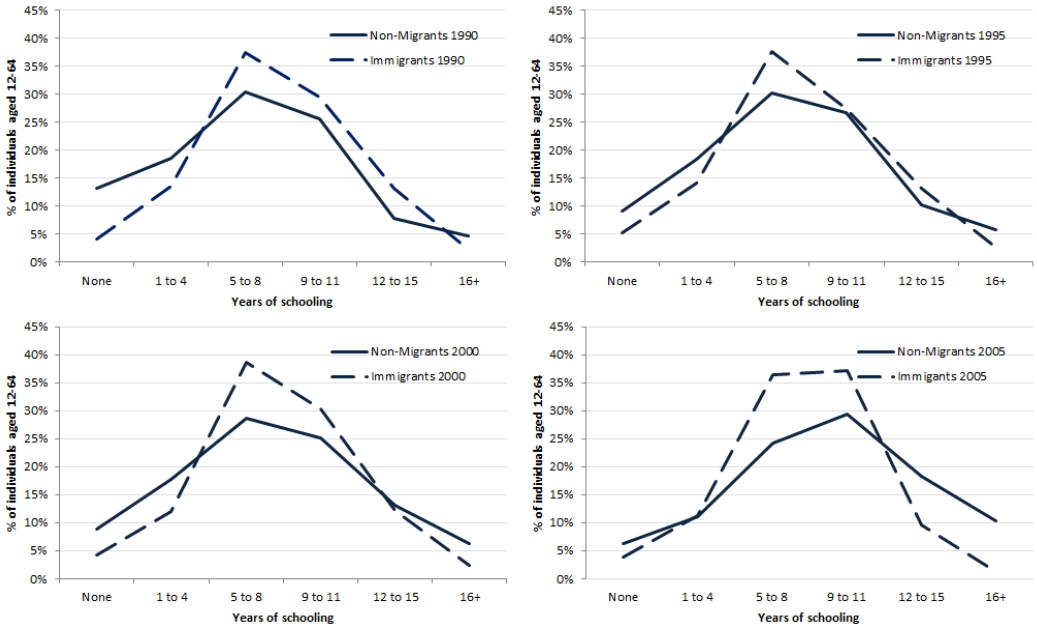
In 1995 there is a change in the trend towards intermediate selection; immigrants seem to be drawn from the middle of the distribution. While 67% of the Mexican population had

Table 14: Returns to Education in Mexico and the United States

Variable	Mexican Residents	Migrants Wages in US
Highest grade completed		
1 to 4	0.1377***	-0.0424
	(0.006)	(0.028)
5 to 8	0.3483***	0.0745***
	(0.006)	(0.024)
9	0.5598***	0.1965***
	(0.006)	(0.030)
10 to 11	0.7070***	0.2417***
	(0.008)	(0.054)
12	0.8481***	0.2456***
	(0.007)	(0.041)
13+	1.4144***	0.4195***
	(0.007)	(0.062)
Observations	701,043	16,882
R-squared	0.2801	0.0486

* The dependent variable is the log wage in Mexico or the U.S. and the independent variables include age, age squared and male. Regressions include fixed effects by state and year, and standard errors are cluster by state.

Figure 8: Years of Schooling Mexican Population and Mexican Immigrants



between 5 and 15 years of schooling, 78% of the immigrant population had those years of schooling. In 2000, the tendency continues, and while 54% of the Mexican population had between 5 and 11 years of schooling, 69% of the immigrant population had that educational attainment.

Finally, for 2005 there seems to be another change in the tendency towards negative selection. Now immigrants are drawn from lower tail of the educational distribution. While 71% of the Mexican population had less than 12 years of schooling, 89% of the immigrant population had less than 12 years of education.

It is important to note that even though the results do not seem to be in line with the model's prediction during the 1990's and early 2000's, (the evidence shows a tendency towards negative selection starting in 2005 as predicted by the model), it is important to take into consideration the composition of the immigrant population according to the state of origin given that compositional effects might be driving the results found in Figure 8.

Therefore, in order to further analyze the type of selectivity observed among Mexican migrants over time we need to control for the proportion of workers migrating from different states of Mexico. Over the last decades there is a significant variation in terms of years of schooling within them. For example, in 2000 while states like Nuevo Leon or Distrito Federal had on average more than 10 years of schooling, states like Michoacan and Veracruz had on average less than 7 years of schooling. Therefore, differences in the average years of schooling between migrants and natives might be due to selectivity, but also due to differences in the proportion of migrants from each state in both samples of workers.

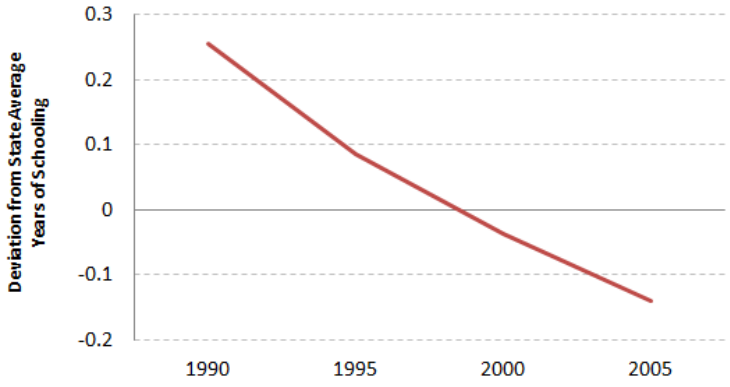
To take into account the differences in average years of schooling across Mexican states I create a variable that measures the gap between the individual's years of schooling and the average years of schooling of the state of origin as a proportion of the years of schooling of the state:

$$desv\_yschool_{ist} = \frac{yschool_{ist} - Average\_state\_yschool_{st}}{Average\_state\_yschool_{st}}.$$

The new variable is shown in Figure 9. The variable has a value of -1 for individuals with no education, it has a value of zero for individuals with educational attainment similar to the average of the state, and it continues increasing as educational level increases.

Over the period of analysis, the gap has decreased, which implies that migrants over time

Figure 9: Gap between the individual's years of schooling and the average years of schooling of the state of origin as a proportion of the years of schooling of the state.



are less educated than the average resident of their state of origin. This evidence suggests that once controlling by state of origin, the selectivity of Mexican migrants has change over time towards a more negative selection, a result different to the one observed in Figure 8 where we did not include any controls.

Given the importance of controlling for factors likely to influence the selectivity of migrants, in the following sections I conduct regression analysis.

3.4.4 Selectivity of Migrants from Different Mexican States

3.4.4.1 Empirical Specification To test for differences in the selectivity observed among workers migrating from different Mexican states, the first step is to estimate the returns to education for each state, in each period of time. Using the 1990 and 2000 Mexican census, the 1995 Population and Dwelling Count, and the 2005 National Survey on Occupation and Employment[4]. I run wage regressions where the dependent variable is the logarithm of the hourly wage and the dependent variables are years of schooling, age and age squared. I estimate the returns to education for males in 1990, 1995, 2000 and 2005.

$$\log wage_{ist} = \alpha_1 \ yschool_{ist} + \alpha_2 age_{ist} + \alpha_3 age_{ist}^2 + \varepsilon_{ist} \tag{3.4}$$

[4]The national Survey on Occupation and Employment (ENOE) is formally introduced in section 4.3.

Once I estimate returns to education (α_1) for each period of time and state, I assign to each migrant observed in the EMIF the returns to education in their state of origin, at the time of entry. Then, I run the following OLS regression:

$$desv\_yschool_{ist} = \beta_1\ ret\_edu_{stj} + \gamma_t + \delta_s + \beta_2 age\_arrival_{ist} + \beta_3 age\_arrival^2_{ist} + \varepsilon_{ist}. \quad (3.5)$$

where $desv\_yschool_{ist}$ is the deviation from the state average years of schooling as proportion of the state average years of schooling for individual i, from state s, who migrated in year t; ret_edu_{stj} are the returns to education (α_1) calculated using equation 3.4, γ_t are fixed effects by year (1990, 1995, 2000 or 2005), and δ_s are fixed effects by state. I cluster standard errors by state in Mexico. The coefficient β_1 will indicate if higher returns to education in the state of origin are associated with lower years of schooling for migrants from that state.

Finally, in order to test if there are differences among individuals from different regions of Mexico, I run equation 3.5 with interactions of returns to education for different regions of Mexico:

$$\begin{aligned} desv\_yschool_{ist} \;=\; & \mu_1\ ret\_edu_{stj} * Western + \mu_2\ ret\_edu_{stj} * Central + \\ & \mu_3\ ret\_edu_{stj} * Southern + \mu_4\ ret\_edu_{stj} * Northern + \\ & \beta_2 age\_arrival_{ist} + \beta_3 age\_arrival^2_{ist} + \gamma_t + \delta_s + \varepsilon_{ist}. \end{aligned} \quad (3.6)$$

3.4.4.2 Results Table 15 shows regression results. I test if higher returns to education in the state of origin are associated with lower years of schooling for migrants from that state. Column 1 shows a positive coefficient but not statistically significant.

Finally, Figure 10 shows the residuals from regression 3.5. It shows the deviation from the average state years of schooling not explained by observable characteristics. The average value of the residuals increases between 1990 and 2000 and decreases in 2005. In the following section I test for selectivity of migrants based on unobservable characteristics.

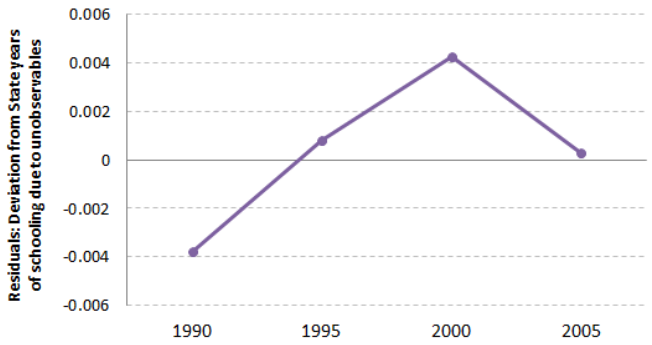
Table 15: OLS Wage Regressions: Selectivity in terms of Years of Schooling

Dependent variable:	Years of schooling-State years of schooling
	State years of schooling
	(1)
Returns to Education	0.005
	(0.0175)
Age arrival	0.0208***
	(0.0039)
Age arrival squared	-0.0005***
	(0.0001)
Married	-0.0747***
	(0.0221)
Dummy 1995	-0.1874***
	(0.0342)
Dummy 2000	-0.3125***
	(0.0316)
Dummy 2005	-0.4025***
	(0.0284)
Constant	0.1077
	(0.1494)
Observations	17,946
R-squared	0.1074

The dependent variable is the difference of the migrant's years of schooling from the state average years of schooling as proportion of the state average years of schooling. The independent variables include age, age squared, and married. The regression includes fixed effects by state, and the standard errors are clustered by state.
*Significant at the 10% level, **significant at the 5% level, ***significant at the 1% level

OLS Regression: Selectivity in terms of Years of Schooling

Figure 10: Residuals: Deviation from state years of schooling not explained by observable characteristics



3.5 SELECTIVITY IN TERMS OF UNOBSERVABLE SKILLS

3.5.1 Borjas' Model

In order to study selectivity in terms of unobserved workers' attributes I use Borjas' 1987 model. Residents from Mexico have earnings distributed according to

$$\ln w_0 = \mu_0 + \varepsilon_0, \tag{3.7}$$

where μ_0 is the mean earnings in Mexico and $\varepsilon_0 \sim N(0, \sigma_0^2)$. The wages earned by this population if they were to migrate to the United States are given by

$$\ln w_1 = \mu_1 + \varepsilon_1, \tag{3.8}$$

where μ_1 is the mean income that residents from the home country would earn in the United States if all home country citizens were to migrate to the United States, $\varepsilon_1 \sim N(0, \sigma_1^2)$, and ε_0 and ε_1 have correlation coefficient ρ_{01}. Equations (3.6) and (3.7) decompose individual earnings into a part due to observable socioeconomic variables (μ_0 and μ_1), and a part due to unobserved characteristics (ε_0 and ε_1)[5]. The migration decision for persons in Mexico is determined by the sign of the index function:

$$I = \ln(w_1/(w_0 + C)) \approx (\mu_1 - \mu_0 - \pi) + (\varepsilon_1 - \varepsilon_0)\,, \tag{3.9}$$

where C represents migration costs and π represents a constant time-equivalent measure of the costs ($\pi = C/w_0$). In this context, the migration occurs if the migrant obtains a positive benefit from migrating (I>0). This will happen with probability

$$P = Pr[\upsilon > -(\mu_1 - \mu_0 - \pi) = 1 - \Phi(z), \tag{3.10}$$

where $\upsilon = \varepsilon_1 - \varepsilon_0$; $z = -(\mu_1 - \mu_0 - \pi)/\sigma_\upsilon$; and, $1 - \Phi(z)$ is the c.d.f.

[5] In general μ_1 need not be the same as that of the U.S. native population since the average skills of the two populations may differ. It is assumed that these inter-country differences in skill have been standardized, and hence μ_1, also gives the earnings of the average native worker in the U.S.

According to this model, the expected conditional earnings in Mexico and the US for individuals who find it optimal to migrate are given by the equations

$$E(\ln w_0|I>0) = \mu_0 + \frac{\sigma_0\sigma_1}{\sigma_\upsilon}\left(\rho_{01} - \frac{\sigma_0}{\sigma_1}\right)\lambda(z), \tag{3.11}$$

$$E(\ln w_1|I>0) = \mu_1 + \frac{\sigma_0\sigma_1}{\sigma_\upsilon}\left(\frac{\sigma_1}{\sigma_0} - \rho_{01}\right)\lambda(z), \tag{3.12}$$

where $\lambda(z) = \Phi(z)/1 - \Phi(z)$.

Based on equations 3.10 and 3.11, the selectivity is then determined by the second component. That is, if the ratio of income dispersions $(\frac{\sigma_0}{\sigma_1})$ >1 and ρ_{01} is "sufficiently" positive, the migrant will be negative selected. The migrant will earn a lower wage than the average individual in the home country and a lower wage than the average individual in the US. On the other hand, if $(\frac{\sigma_0}{\sigma_1})$ <1 and ρ_{01} is "sufficiently" positive, we will observe positive selection in migration. The migrant will come from the upper tail of the distribution of the home country (he will earn higher wage than average individual) and will outperform the average individual in the US. Since income dispersion in Mexico has been more unequal than in the US ($\sigma_0 > \sigma_1$) Borjas' model predicts that the typical Mexican immigrant should come from the lower tail of the distribution.

3.5.2 Selectivity of Legal and Illegal Workers

In order to study the degree of selectivity affecting workers migrating legally and illegally to the United States it is important to discuss the differences in their migration costs. If legal and illegal workers face different migration costs Borjas' model can be used to predict the type of selectivity affecting both groups of workers.

In the model migration costs are constant across individuals. Therefore, when we analyze the selectivity of migrants by legal status, we can assume that all legal migrants face the same migration costs, but that cost is different to the cost faced by all illegal migrants. As it is shown in Figure 11, Borjas' model predicts that higher migration cost should be associated with more negative selection of workers. According to the model negative selection occur if the immigrant flow was originally negatively selected (if the correlation between ε_0 and ε_1

are sufficiently positive and the income distribution is more unequal in the home country than in the US) and a more positive selection if immigrants were originally positively selected (if the correlation between ε_0 and ε_1 are sufficiently positive and the income distribution is more unequal in the US than in the home country).

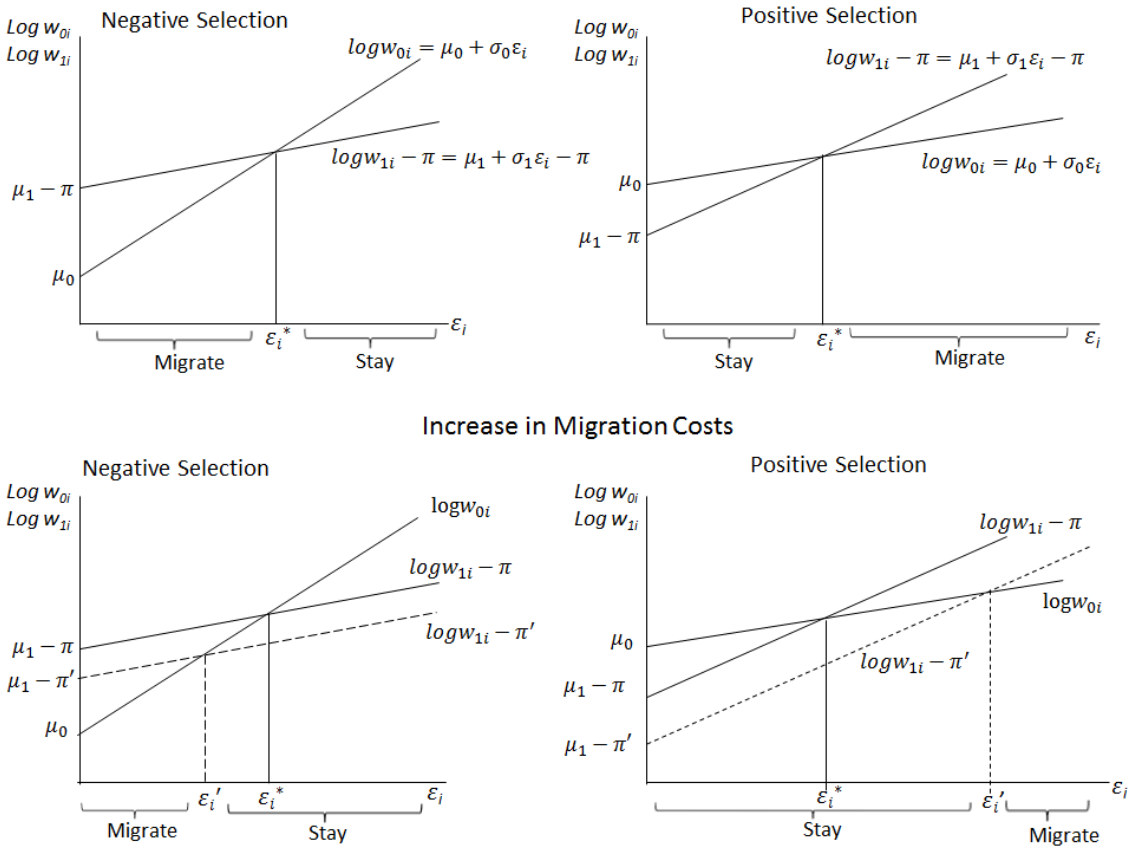
For simplicity, in the graphical analysis shown in Figure 11 I assume perfect correlation between wages in Mexico and the US or $\rho_{01} = 1$.Therefore, we can use one term to describe the individual skill level $\frac{\varepsilon_{0i}}{\sigma_0} = \frac{\varepsilon_{1i}}{\sigma_1} = \varepsilon_i$. Therefore, I can rewrite $\log w_{0i} = \mu_0 + \sigma_0 \varepsilon_i$ and $\log w_{1i} = \mu_1 + \sigma_1 \varepsilon_i$.

While there exist a large service industry of lawyers and other specialists who can help individuals to migrate legally to the US (by managing the US admission process and the bureaucratic requirements involving extensive paperwork and repeated interactions with US immigration authorities), there is also a large service industry oriented towards illegal immigration. Illegal workers need to cross the border, find transportation to a safe location in the US, and obtain counterfeit residency documents or hire a smuggler to provide these services.

Even though there are some estimates regarding the migration costs of workers migrating legally and illegally to the US, the differences in the type of services received by both groups of workers do not allow us to draw conclusions regarding which group faces higher migration costs. Orozco (2011) finds that migration costs for undocumented workers who entered between 1998 and 2005 were 4 months of their income prior to migration using data from the EMIF. Immigrants paid on average $960 (in 2001 US dollars) in smuggler fees, $170 (in 2001 US dollars) in transportation and other expenses, while their average monthly income prior to migration was $270 (in 2001 US dollars). Additionally the OECD reports in its Economics Surveys 2002-2003 for Mexico that the median smuggler fee reported in the Mexican Migration Project survey was about US$600 in 1998 and between US$1,000 and US$1700 at the start of the 2000s.

With respect to migration costs for workers entering legally, while the non-immigrant visa application fee is $150, immigration lawyers' fees for preparing a visa application depend on the nature and complexity of the case, location and attorney's level of experience.

Figure 11: Effect of changes in Migration Costs according to Borjas' Model



In the analysis we assume perfect correlation between wages in Mexico and the U.S. or $\rho_{01} = 1$.

Therefore, we can use one term to describe the individual skill level: $\frac{\varepsilon_{0i}}{\sigma_0} = \frac{\varepsilon_{1i}}{\sigma_1} = \varepsilon_i$

and rewrite $logw_{0i} = \mu_0 + \sigma_0\varepsilon_i$ and $logw_{1i} = \mu_1 + \sigma_1\varepsilon_i$.

If we assume that migration costs are higher for illegal workers Borjas' model would predict a more negative selection among that group of workers if they were originally negatively selected; and a more positive selection among that group of migrants if they are originally positively selected. In the next sections I will test if Borjas' predictions relative to the type of selectivity observed among legal and illegal workers are supported by the empirical evidence.

3.5.3 Empirical Specification

According to Borjas' model, the average earnings of immigrants can be written as

$$E(\ln w_0 | I > 0) = \mu_0 + \lambda \frac{\sigma_0 \sigma_1}{\sigma_v} \left(\rho - \frac{\sigma_0}{\sigma_1} \right),$$

which implies that an increase in income inequality represented as an increase in the ratio of variances of the income distribution in Mexico relative to that in the United States $\left(\frac{\sigma_0}{\sigma_1}\right)$ should worsen the earnings of those migrants who find it optimal to migrate to the United States with respect to the earnings of non-immigrants in Mexico with the same observable characteristics.

In order to test how income inequality impacts the degree of selectivity of Mexican immigrants I exploit the variation of income inequality in different states of Mexico over time using OLS regressions.

The first step is to predict the wage that the worker could have earned in Mexico if he had not migrated from state s in period t based on his observable characteristics. I estimate OLS regressions using Mexican census data and the 1995 Population and Dwelling Count. The dependent variable is the logarithm of the hourly wage and the independent variables are years of schooling, age of arrival, age of arrival squared, experience prior to migration, experience prior to migration squared, and interactions between years of education, experience and age.

$$\begin{aligned} \ln wage_{ist}^{Mex} &= \alpha_1 yschool_{ist} + \alpha_2 age_{ist} + \alpha_3 age_{ist}^2 + \alpha_4 experience_{ist} + \alpha_5 experience_{ist}^2 \\ &\quad + \alpha_6 yschool_{ist} * age_{ist} + \alpha_7 yschool_{ist} * experience_{ist} \\ &\quad + \alpha_8 experience_{ist} * age_{ist} + \varepsilon_{ist} \end{aligned} \tag{3.13}$$

The coefficients obtained in regression 3.12 will be used to estimate the wages that migrants surveyed by the EMIF would have earned if they had not migrated. Using $\alpha_1 - \alpha_8$ and the migrants' characteristics, I estimate $\ln \widehat{wage}_{ist}^{Mex}$. In order to predict workers' wages individuals were grouped by year of arrival into 3 categories. For individuals who migrated between 1990 and 1992 predicted wages were estimated the $\alpha's$ obtained from running regression 3.12 using census data from 1990, for those who entered between 1993 and 1997 the $\alpha's$ obtained using data from the 1995 Population and Dwelling Count was used, and finally, for those who entered between 1998 and 2005 the $\alpha's$ used to predict their wages are estimated using the 2000 Mexican census. I predict the wages of immigrants surveyed by the EMIF who migrated to the United States between 1990 and 2003 who were surveyed within the first 3 years after entering the US, who were working in Mexico prior to migration and reported their wages.

Then I estimate the portion of the wage in Mexico associated with workers' unobservable characteristics (the difference between the logarithm of the real hourly wage of individual i, who migrated from state s at time t, and the logarithm of the predicted wage that the worker could have earned in Mexico if he had not migrated from state s in period t).

$$unobservable_{ist}^{Mex} = (\ln wage_{ist}^{Mex} - \ln \widehat{wage}_{ist}^{Mex})$$

The next step is to run an OLS regression (Model 1) where the dependent variable is the portion of the wage in Mexico associated with workers' unobservable characteristics. As independent variables I include the ratio of the Gini coefficient for the Mexican state s at time t, to the Gini coefficient for the United States at time t[6]. Additionally, since social networks are an important factor likely to influence the type of selectivity observed among immigrants, I include the size of the immigrant network in the United States for workers from different states of origin (proxied by the number of the immigrants who migrated in the previous five years as a proportion of the current population of each Mexican state).

[6] I use the Gini coefficient for the United States (not by state) because when individuals make the decision to migrate they have a general idea of the prevailing economic conditions in the United States, and an expectation of the wages they could earned, but not very detailed information about the state where they will end up working. Moreover, the EMIF reports the state of the US where immigrants were working at the time of the survey, but not the first state where they worked after migrating. As a future extension, Gini coefficients by state in the US will be included.

Finally, I include migration costs (proxied by the distance from the capital of the state of origin in Mexico to the state of destination in the United States), and the logarithm of the state GDP per capita. The regression includes controls for state of residence in Mexico prior to migration, year of migration, duration in the US at the time of the survey, and the number of years passed between the year of migration and the year of the Census used to predict the worker's wage ($\ln \widehat{wage}_{ist}^{Mex}$). Additionally, I cluster standard errors by state of residence in Mexico and include sample weights.

I estimate this regression using data of immigrants who migrated to the United States between 1990 and 2003 who were surveyed within the first 3 years after entering the US, who were working in Mexico prior to migration and reported their wages. Additionally, I restrict the sample to include males who were born in Mexico, aged 12 to 64 at the time of migration, and eliminate 0.05% of the observations with the highest and lowest hourly wages.

$$\begin{aligned} unobservable_{ist}^{Mex} &= \beta_1 gini_{st}^{Mex}/gini_t^{US} + \beta_2 networks_{st} \\ &\quad + \beta_3 migration\_costs_{ist} \\ &\quad + \beta_4 \ln gdp\_percapita_{st} + \varepsilon_{ist} \end{aligned} \tag{3.14}$$

In order to test for differences in the selectivity of individuals migrating legally and illegally to the US, Model 2 includes the regressors included in Model 1 plus a dummy variable for workers who migrated legally to the US and an interaction of the ratio of the Gini coefficients between Mexico and the United States and the dummy variable for legal status at the time of entry.

$$\begin{aligned} unobservable_{ist}^{Mex} &= \beta_1 gini_{st}^{Mex}/gini_t^{US} + \beta_2 gini_{st}^{Mex}/gini_t^{US} * legal\_entry \\ &\quad + \beta_3 legal\_entry_{ist} + \beta_4 networks_{st} + \beta_5 migration\_costs_{ist} \\ &\quad + \beta_6 \ln gdp\_percapita_{st} + \varepsilon_{ist} \end{aligned} \tag{3.15}$$

Next, in order to test for differences in the selectivity of workers based on their observable characteristics I run an OLS regression (Model 3) where the dependent variable is the logarithm of the predicted wage that the worker could have earned in Mexico if he had

not migrated from state s in period t. The independent variables and the controls used are the ones included in Model 1. I cluster standard errors by state of residence in Mexico and include sample weights. Additionally, I test for differences in the type of selectivity of workers by legal status. Model 4 includes the regressors included in Model 3 plus a dummy variable for workers who migrated legally to the US and an interaction of the ratio of the Gini coefficients between Mexico and the United States and the dummy variable for legal status at the time of entry.

$$\begin{aligned} observable_{ist}^{Mex} &= \ln \widehat{wage}_{ist} = \beta_1 gini_{st}^{Mex}/gini_t^{US} + \beta_2 networks_{st} \\ &\quad + \beta_3 migration\_costs_{ist} + \beta_4 \ln gdp\_percapita_{st} + \varepsilon_{ist} \end{aligned} \tag{3.16}$$

$$\begin{aligned} observable_{ist}^{Mex} &= \beta_1 gini_{st}^{Mex}/gini_t^{US} + \beta_2 gini_{st}^{Mex}/gini_t^{US} * legal\_entry_{ist} \\ &\quad + \beta_3 legal\_entry_{ist} + \beta_4 networks_{st} + \beta_5 migration\_costs_{ist} \\ &\quad + \beta_6 \ln gdp\_percapita_{st} + \varepsilon_{ist} \end{aligned} \tag{3.17}$$

It is important to note that the immigration phenomenon, and the selectivity observed among those immigrants can potentially affect the degree of income inequality in Mexican states, especially in the long run. If immigrants are drawn from the lower tail of the income distribution, their migration decision could have a positive effect on the income distribution (decreasing income inequality) of their state of origin. Previous literature studying the effect of migration on inequality has focused on the effect of remittances. Their findings show that remittances decrease income inequality and poverty especially when they are used for investment purposes (Taylor, Mora, Adams, and Lopez-Feldman 2005, Taylor 1999, Adelman and Taylor 1990). If this were the case, the results could be potentially biased due to a problem of reverse causality. However, given that a more negative selection of immigrants can potentially be correlated with a decrease in income inequality, my estimates could be underestimating the true effect but could be interpreted as a lower bound. Fortunately, there is no evidence that this empirical specification is affected by reverse causality. Individuals make the decision to migrate when they look at the current economic conditions (current

income inequality). Even though their decision to migrate can potentially impact the income inequality that will be faced by individuals next period, the evidence shows that changes in the selectivity affecting immigrants is not a determinant factor of the degree of inequality observed in Mexican states. This results suggest that remittances are used mainly for consumption purposes and do not affect the income inequality in sending regions.[7].

Finally, I analyze the effect of changes in income inequality but using the wages of workers in the United States, an exercise similar to Borjas' empirical analysis. The first step is to predict the wage that workers were earning in the United States one year after migration based on their observable characteristics and their legal status. I estimate an OLS regression using data of earnings in the United States of male workers surveyed by the EMIF between 1993 and 2005, who were born in Mexico, aged 12 to 64 at the time of migration, aged 12 to 64 at the time of the survey, who worked in the United States at least one month and reported their earnings.

The dependent variable is the logarithm of the hourly wage in the US of worker i, who migrated from state s, and that is surveyed by the EMIF at time T, and the independent variables are years of schooling, age, age squared, experience in the United States (calculated as the difference between the year of migration and the year in which the survey was conducted), experience squared, interactions between years of education, experience and age, a dummy variable for legal status, and controls by the calendar year of migration.

$$\begin{aligned} \ln wage^{US}_{isT} &= \alpha_1 yschool_{isT} + \alpha_2 age_{isT} + \alpha_3 age^2_{isT} + \alpha_4 experience\_US_{isT} \\ &+\alpha_5 experience\_US^2_{isT} + \alpha_6 yschool_{isT} * age \\ &+\alpha_7 yschool_{isT} * experience\_US_{isT} \\ &+\alpha_8 experience_{isT} * age + \alpha_9 year\_entry_{isT} + \varepsilon_{isT} \end{aligned} \tag{3.18}$$

I use the coefficients ($\alpha's$) of regression 3.17 to calculate the predicted wages of workers $\left(\ln \widehat{wage^{US}_{ist+1}}\right)$ with one year of experience in the United States (at $t+1$) who entered legally and illegally to the United States.

[7] The evidence shows that shortly after migration, remittances are more likely to be used to repay loans and consumption expenditures rather than for investment purposes. This phenomenon could explain why we do not observe an effect on income inequality in the short run.

In order to test for differences in the selectivity of workers based on their observable characteristics I run an OLS regression (Model 5) where the dependent variable is the logarithm of the predicted US wages at time $t+1$ and the independent variables are the ratio of the Gini coefficient for the Mexican state s at time t, to the Gini coefficient for the United States at time t, the size of the immigrant network, migration costs, and the logarithm of the GDP per capita from the state of origin in Mexico. The regression includes controls for state of residence in Mexico prior to migration, controls for the state of destination in the United States, controls for the industry in which immigrants work, and year of migration. I run the regression separately among individuals working legally and illegally in the United States, cluster standard errors by state of destination in the United States and include sample weights. This regression includes workers aged 12-64 at the time of entry, aged 12-64 at the time of the survey and who worked in the US for at least six months.

$$\begin{aligned} observable^{US}_{ist+1} &= \ln \widehat{wage}^{US}_{ist+1} = \beta_1 gini^{Mex}_{st}/gini^{US}_{t} + \beta_2 networks_{st} \\ &\quad + \beta_3 migration\_costs_{ist} + \beta_4 \ln gdp\_percapita_{st} + \varepsilon_{ist} \end{aligned} \tag{3.19}$$

3.5.4 Results

Table 16 shows the average earnings and years of schooling for the Mexican population. While there have not been significant changes in the average earnings of workers, there have been important improvements in educational attainment during the period of analysis. Table 17 shows the average returns to unobservable skills, predicted earnings and observed earnings in Mexico prior to migration by year of entry. The evidence shows that immigrants from more recent cohorts have more unobserved skills, have more years of schooling, and earned higher wages in Mexico prior to migration.

Table 18 shows years of schooling, predicted and observed earnings in the United States by legal status. It is important to note that this sample is larger than the one used in Table 17 since the restriction of working prior to migration is eliminated. On the other hand,

Table 16: Earnings and Years of Schooling of the Mexican Population

	Mexican Population		
	1990	1995	2000
Real earnings**	2.56	2.62	2.53
	(1.20)	(0.82)	(0.82)
Years of schooling	7.64	8.77	8.94
	(4.48)	(4.22)	(4.44)

* Standard deviations in parenthesis.
** Log wages in pesos of 2001.

Table 17: Earnings Prior Migration and Unobservable Skills of Mexican Immigrants

	Immigrants by Year of Migration		
	1990	1995	2000
Unobservable skills	-1.10	-0.57	0.11
	(0.62)	(0.64)	(0.62)
Predicted earnings Mexico**	2.37	2.23	2.25
	(0.25)	(0.28)	(0.27)
Real earnings in Mexico**	1.29	1.67	2.36
	(0.62)	(0.64)	(0.63)
Years of schooling	5.98	5.95	6.38
	(4.04)	(3.36)	(3.30)

* Standard deviations in parenthesis.
** Log wages in pesos of 2001.

Table 18: Years of Schooling, Predicted and Observed Earnings in the United States of Immigrants by Legal Status

	Immigrants by Year of Migration					
	1990		1995		2000	
	Legal	Illegal	Legal	Illegal	Legal	Illegal
Predicted earnings US**	1.72	1.50	1.82	1.57	1.89	1.64
	(0.13)	(0.10)	(0.12)	(0.09)	(0.14)	(0.10)
Real earnings in US**	1.98	1.78	2.00	1.73	1.86	1.70
	(0.58)	(0.76)	(0.62)	(0.74)	(0.65)	(0.69)
Real earnings in Mexico***	1.99	1.89	1.81	1.81	2.40	2.42
	(0.61)	(0.78)	(0.82)	(0.79)	(0.78)	(0.70)
Years of schooling	7.94	7.61	8.92	7.26	8.55	6.88
	(3.78)	(3.31)	(3.66)	(3.26)	(4.12)	(3.26)

* Standard deviations in parenthesis.

**Log wages in dollars of 2001.

*** Log wages in pesos of 2001.

this sample includes immigrants who worked in the US, reported their wages, and stayed in the United States at least six months. The evidence shows that, as has been found in previous literature, legal workers earn higher wages than illegal workers in the United States. Moreover, with respect to years of schooling the results show that legal workers have more years of education than illegal workers, and the gap seems to be increasing over time.

Table 19 shows the regression results. The evidence supports Borjas' negative selection hypothesis, an increase in the income inequality of Mexico relative to that of the United States, is associated with lower average wages associated to unobservable skills for the workers who find it optimal to migrate. An increase of 0.1 in the ratio of the Gini coefficient for the state of residence in Mexico relative to the Gini coefficient for the United States is associated with a decrease of 6.7 log points the average wages associated with unobservable skills. Similar to Borjas' (1987) results, lower GDP per capita is associated with more negative selection, but the coefficient is not statistically significant. With respect to social networks and distance from origin to destination the coefficients are not statistically significant.

The results of Model 2 show that when we analyze the selectivity of workers migrating legally and illegally to the United States, even though both coefficients are negative, we do not find significant differences between the coefficients for both groups of workers.

Models 3 and 4 show that when we look at workers' predicted wages (based on workers'

Table 19: Effect of Changes in Income Inequality on the Selectivity of Mexican Migrants using Earnings Prior Migration

	Unobservable skills		Observable skills	
	Model 1	Model 2	Model 3	Model 4
$Gini^{Mex}/Gini^{US}$	-0.675 **		-0.268	
	(0.306)		(0.209)	
$Gini^{Mex}/Gini^{US}$*Legal		-1.038		-0.308
		(0.713)		(0.258)
$Gini^{Mex}/Gini^{US}$*Illegal		-0.588 **		-0.261
		(0.287)		(0.210)
Legal at entry		0.394		0.153
		(0.734)		(0.115)
Age				
Age squared				
Per Capita GDP	0.053	0.096	0.633 ***	0.602 ***
	(0.530)	(0.534)	(0.164)	(0.159)
Distance	0.018	0.020	0.001	-0.001
	(0.028)	(0.029)	(0.009)	(0.009)
Network	-0.032	-0.030	0.010	0.008
	(0.019)	(0.019)	(0.012)	(0.011)
Constant	-263.6 ***	-261.6 ***	35.47 ***	34.04 ***
	(27.428)	(28.097)	(9.162)	(9.459)
Observations	4,321	4,321	4,321	4,321
Adj R-squared	0.2741	0.2754	0.4178	0.4335

Includes fixed effects by state and year. Standard errors are clustered by state.

Table 20: Effect of Changes in Income Inequality on the Selectivity of Mexican Migrant

Observable skills (Predicted wages)				
	Legal		Illegal	
$Gini^{Mex}/Gini^{US}$	-0.092	**	-0.057	***
	(0.043)		(0.013)	
Per Capita GDP	0.059	*	0.004	
	(0.032)		(0.028)	
Distance	-0.012		-0.001	
	(0.013)		(0.007)	
Network	-0.001		0.003	**
	(0.003)		(0.001)	
Constant	-30.7	***	-29.54	***
	(2.024)		(1.328)	
Observations	3,011		5,590	
Adj R-squared	0.378		0.3681	

*Standard deviations in parenthesis.

Regressions includes fixed effects by year and state.

observable characteristics), an increase in income inequality is associated with lower wages prior to migration but the coefficients are not statistically significant. In these models we can observe that lower GDP per capita is associated with more negative selection, and that the results for distance and immigrant networks are not statistically significant.

Table 20 shows the effect of changes in income inequality on the selectivity of workers by using predicted US wages of recently arrived immigrants These results also support Borjas' hypothesis. Higher income inequality is associated with lower earnings for workers entering legally and illegally to the United States. For legal workers an increase of 0.1 in the ratio of the Gini coefficient for the state of residence in Mexico relative to the Gini coefficient for the United States is associated with a decrease of 0.92 log points in the average wages associated with observable skills. For illegal workers, an increase of 0.1 in the inequality ratio is associated with a decrease of 0.57 log points in the average observable wages. It is important to note that even though both coefficients are negative and significant, they are not statistically different from each other. These results suggest that while both groups of immigrants behave as predicted by Borjas' model, there does not seem to be important differences in the degree of selectivity observed between both groups of workers.

With respect to social networks I find that for the coefficient is not statistically significant for legal workers but is positive and significant for illegal workers. While larger migration networks have been previously associated with lower migration costs, especially among illegal workers, larger social networks have also been associated with better labor market outcomes of Mexican, especially among illegal workers. Finally, with respect to the GDP per capita from state of origin I find positive coefficients. Lower GDP per capita is associated with more negative selection for both groups of workers, a result in line with the findings of Borjas 1987 and Jasso and Rosenzweig 1990.

3.6 CONCLUSIONS

In this paper I test Borjas' 1987 negative selection hypothesis which states that individuals migrating from states with more unequal income distributions and higher returns to skills will be more negatively selected. I exploit the variation in returns to education and income inequality across states in Mexico and over time to test for differences in the type of selectivity observed among legal and illegal immigrants. First, I analyze the selectivity in terms of years of schooling. Then, using Borjas' selection model I infer worker's unobservable skills by using data of earnings prior to migration and analyze the degree of selectivity based on observable and unobservable skills. Additionally, and following Borjas' 1987 empirical specification, I predict the US wages of recently arrived immigrants to test for differences in the degree of selectivity observed among Mexican workers. I control for migration costs and the size of immigrants' social networks, two important factors likely to influence immigrants' selectivity.

I use data of Mexican immigrants from the Survey of Migration to the Northern Border (EMIF). Among the advantages of using this survey are that it provides information of earnings prior to migration and earnings in the United States; identifies workers by legal status, and is conducted among workers temporarily and permanently settled in the United States which allows me to account for return migration.

When I study years of education, while aggregate analysis find evidence of positive, intermediate and negative selection in different periods of time, once we control for compositional

effects we find evidence of negative selection of Mexican migrants at the state and region level over the period of analysis. When I study the selectivity of workers using earnings prior to migration I find that an increase in the income inequality of Mexico relative to that of the United States, is associated with lower wages associated to unobservable skills for the individuals who migrate to the United States.

Moreover, when I study the selectivity of workers using earnings in the United States the evidence is also in line with Borjas' predictions. An increase in the income inequality of Mexico relative to that of the United States is associated with lower wages associated with observable skills for the workers who migrate legally and illegally to the United States. Even though the results show that both groups of workers behave according to Borjas' hypothesis, the evidence shows that there are not significant differences in the degree of selectivity affecting both groups of workers.

4.0 RETURN MIGRATION AND SELF-EMPLOYMENT IN MEXICO

4.1 MOTIVATION

Over the last four decades, Mexican households perceived immigration, whether temporary or permanent, to be an effective strategy for sustaining and improving their economic likelihoods. On average, between 2001 and 2010, total remittances accounted for over $20 billion dollars, representing one of the largest sources of foreign income in Mexico.

One channel through which migration may reduce poverty and promote growth is by enhancing the asset positions and productivity levels of poor households, either via remittances and savings, or human capital accumulation. Households often face significant production constraints due to absent or incomplete credit markets. Remittances and savings from work abroad, thus, may enable individuals to set up their own business upon return overcoming liquidity constraints, low initial endowments or imperfect credit markets. In addition, the skills acquired by migrants in the host countries may be put to productive use upon return.

The empirical literature studying the effect of return migration on the probability of self-employment has shown mixed results. While some studies have found evidence that return migration contributed to the relaxation of credit constraints, fostering productive investment (Woodruff et al., (2004); Dustmann et al., (2002); Murphy, (2000)), others have found that remittances and savings are mainly used for consumption and non-productive investment having no impact on investment, development and growth (King et al., (2003); Kule et al., (2002); Carletto et al., (2004); Germenji et al., (2004)).

In this chapter I assess the impact of return migration on self-employment exploiting the variation in return migration rates to different states of Mexico in two different periods

of time. I predict return migration to different Mexican states by using past migration patterns and use these predicted rates as instruments for return migration avoiding potential endogeneity issues.

Different to what has been done in the literature, I study the effect of return migration, not only remittances, on self-employment. I exploit the variation in the return migration rates in Mexico over states and over time, use instrumental variables to solve for possible endogeneity biases, and estimate the effect of return migration considering only those migrants who return to Mexico after working in the United States for a period of time. During the last years there has been an increase of return migration among Mexican immigrants in the United States. According the Pew Hispanic Center, approximately 670,000 workers returned to Mexico between 1995 and 2000, and the number of return migrants more than doubled to 1,390,000 between 2005 and 2010. However, the increase in the number of return migrants has also been characterized by changes in the characteristics of those who return. During the last years there has been an increase in the number of migrants who decide to return to Mexico after several failed attempts to enter the US undocumented, after being caught by the border patrol, or after being unsuccessful finding a job in the United States. This issue is relevant since an increase in the total number of return migrants driven by an increase in the number of individuals who spent short periods of time and did not work in the United States will negatively affect their savings, will not change migrants' human capital or savings (remittances), and consequently, will not have a positive effect on the probability of becoming self-employed.

The results show that return migration rates have small but significant effect on the probability of entering self-employment. An increase of one percent in the number of return migrants as proportion of the total population aged 18-45 would increase self-employment between 12.0 and 13.0 percentage points. A one percent increase in the number of return migrants as proportion of the total population represents a 100% increase in the number of return migrants in the states with the highest ratios of return migrants to total population.

These results are in line with the literature that has found a small but positive effect of migration and remittances on investment and the decision to become self-employed. Those

studies have found that remittances tend to be disproportionately used for consumption and non-productive investment. To verify if those arguments are valid for the case of Mexican return migrants, I use data on the uses of remittances reported by workers surveyed by the EMIF. The evidence shows that a large number of return migrants report they used remittances for consumption purposes. While 77% of the migrants reported that remittances are spent on the consumption of non-durable goods and rent payments, 11% reported that remittances are spent on housing, 6% to pay previous debts, and 2% to buy durable goods.

On the other hand, 2% of remittances are used to buy land or agricultural equipment and 2% are used to improve or start a new business. For these groups of workers savings and remittances enable individuals to set up their own business overcoming liquidity constraints, low initial endowments or imperfect credit markets. These factors significantly increase the probability of entering self-employment upon return.

4.2 LITERATURE REVIEW

Self-employment is the simplest form of entrepreneurship (Blanchflower and Oswald, (1998)). An entrepreneur is a utility maximizer; he makes his occupational choice after comparing the expected payoffs of becoming self-employment or wage worker. Individuals undertake self-employment if their expected utility from self-employment is higher, and wage work otherwise. The literature on participation in self-employment identifies different factors likely to influence workers decisions such as entrepreneurship abilities, human capital, and institutional factors such as access to credit and liquidity constraints. Evans and Leighton (1989), Holtz-Eakin et al. (1994), and Blanchflower and Oswald (1998)) find evidence of a positive correlation between wealth and entry into self-employment[1].

Regarding the relationship between return migration and migrants' decision into self-employment there is a large body of literature. Previous studies have focused on the occupational choice of migrants upon return and the determinants of their subsequent entrepreneurial activities. Migration experience may enhance the asset positions, productivity levels

[1] Hurst and Lusardi (2004) find this positive relation is present only among the very rich.

and entrepreneurial ability of households, and thus, enable individuals to set up their own business upon return overcoming liquidity constraints, low initial endowments or imperfect credit markets.

Theoretically, the immigration literature has studied migration and return migration as a cost-benefit decision where individuals maximize their expected lifetime earnings. Borjas and Bratsberg (1996) develop a model that incorporates two theories of return migration. In their model, return migration might occur if immigrants based their initial migration decision on erroneous information about expected wages and migration costs, and also as part of an optimal life-cycle residential location sequence. Immigrants decide to migrate for a few years, accumulate financial resources or other types of capital, and then return to their home country. The underlying idea in this model is that individuals migrate to accumulate capital (skills, human capital, experience, and savings) that will enable them to start new higher-level activities upon return.

In models of temporary migration, the optimal migration duration and migrants' after-return activities are decided simultaneously. Dustmann and Kirchkamp (2002) develop a model where migrants decide the optimal migration duration and their after-return activities simultaneously. The model is tested using unique survey data set of Turkish immigrants to Germany finding that more than half of the returning migrants are economically active after return, and most of them engage in entrepreneurial activities. In this setting, savings and remittances of migrants may provide capital inflows and help to overcome capital constraints faced by low income households.

Mesnard (2004) analyzes how capital market imperfections influence return migration and shows that return migration may be one way to overcome capital constraints. Using data from Tunisia, he finds evidence that high savings brought back by return migrants positively influence the choice to become and entrepreneur after return. The positive impact of savings on the decision to become self-employed is also supported by the findings of Ilahi (1999) who uses data for Pakistan, Mc Cormick and Wahba (2001) and Wahba and Zanou (2009) who use data for Egypt, and Piracha and Vadean (2010) who use data from Albania.

While in the literature we can find studies conducted in different countries that support

the finding that return migrants exhibit a higher tendency for self-employment over wage employment, little has been done to study the effect of return migration on self-employment in Mexico. Gitter (2008) uses the 2002 wave of the Mexican Family Life Survey to study the labor market outcomes of return migrants. He analyzes the behavior of a small sample of return migrants who spent less than a year in the US and finds that return migration has no significant effect on the probability of employment, either self-employment or wage employment.

Another line or research has focused on the effect and uses of remittances in Mexico finding contradictory evidence. Woodruff and Zenteno (2004, 2007) and Woodruff (2006) examine the effect of remittances and migration networks on the level of capital and investment of microenterprises. Using data from Mexican surveys of urban microenterprises conducted between 1992 and 1998 they find that investment in microenterprises is positively associated with higher migration rates and with larger migration networks.

On the other hand, different studies analyzing the uses of remittances in small communities in Mexico have found conflicting results. Those studies have shown that remittances tend to be disproportionately used for consumption having no impact on investment, development and growth (Dinerman (1982) and Lopez (1986)). A number of studies using data from different countries endorse the view that the fruits of migration are primarily spent in conspicuous consumption and non-productive investments, such as housing, and may be conducive of increases in leisure among household members left behind. Evidence on Albania is suggestive of this latter view (King et al., (2003); Kule et al., (2002); Carletto et al., (2004); Germenji et al., (2004)). Murillo Castaño (1988) highlights how in the case of Colombian return migrants from Venezuela, savings were used to buy, establish, or expand self-employment activities, however, only after basic needs of the household members have been satisfied.

Table 21: Summary Statistics: ENOE

	2005				2011			
	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
Age	32.3	11.2	18	65	32.8	11.3	18	65
Years of schooling	9.4	4.0	0	16	10.0	3.8	0	16
Experience	16.6	11.9	1	53	16.6	12.1	1	53
Married	0.62	0.49	0	1	0.59	0.49	0	1
Ocupation:								
Self_employed	0.13	0.34	0	1	0.12	0.32	0	1
Employee	0.81	0.40	0	1	0.83	0.38	0	1
Employee w/o paid	0.03	0.16	0	1	0.02	0.15	0	1
Employer	0.04	0.19	0	1	0.03	0.17	0	1
Sector:								
Agriculture	0.05	0.21	0	1	0.05	0.22	0	1
Construction	0.13	0.34	0	1	0.13	0.33	0	1
Manufacturing	0.21	0.40	0	1	0.19	0.39	0	1
Commerce	0.20	0.40	0	1	0.20	0.40	0	1
Services	0.39	0.49	0	1	0.42	0.49	0	1
Other	0.02	0.14	0	1	0.02	0.13	0	1
Region in Mexico:								
Northern	0.28	0.45	0	1	0.28	0.45	0	1
Western	0.20	0.40	0	1	0.21	0.41	0	1
Southern	0.52	0.50	0	1	0.51	0.50	0	1
Observations	41,402				39,011			
Sum of weights	9,611,900				10,362,444			

4.3 DATA

This study uses data from the 2005 and 2011 National Survey on Occupation and Employment (ENOE), the 1993-2010 Southward-bound section of the EMIF, and the 2000 Mexican Census. The ENOE is a quarterly survey with a rotating panel of sampled households similar in structure to the Current Population Survey (CPS). Each ENOE household remains in the survey for five consecutive quarterly interviews. The ENOE has existed since 2005 when it replaced the quarterly National Employment Survey (ENE). I use data from the first quarter of 2005 and 2011. Table 21 shows summary statistics for the individuals surveyed by the ENOE in 2005 and 2011. Figure 12 shows the number of migrants surveyed between 1993 and 2010 by year of entry and Table 22 shows a summary statistics for the sample of return migrants.

It is important to note that while a large number of workers return to Mexico after staying very short periods of time in the US (e.g., if they were caught by the border patrol,

Figure 12: All Migrants Surveyed by the EMIF between 1993 and 2010 by year of entry

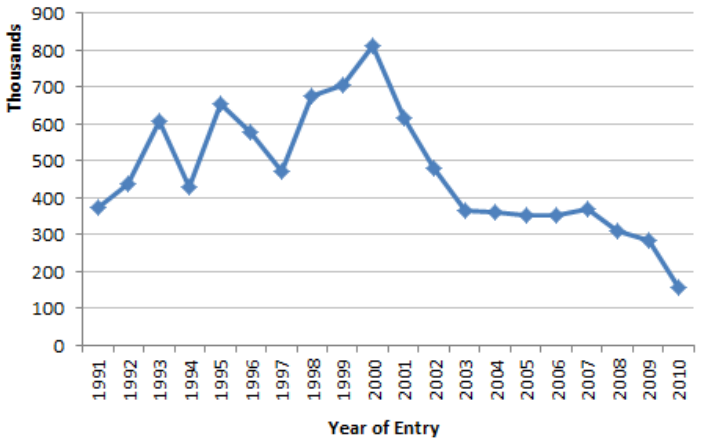
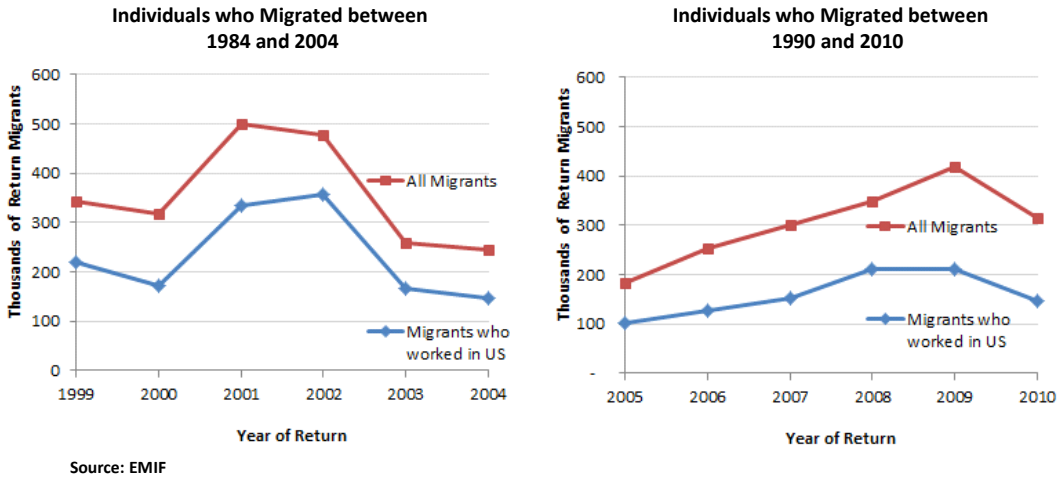


Table 22: Summary Statistics: Returned Migrants Surveyed by the EMIF

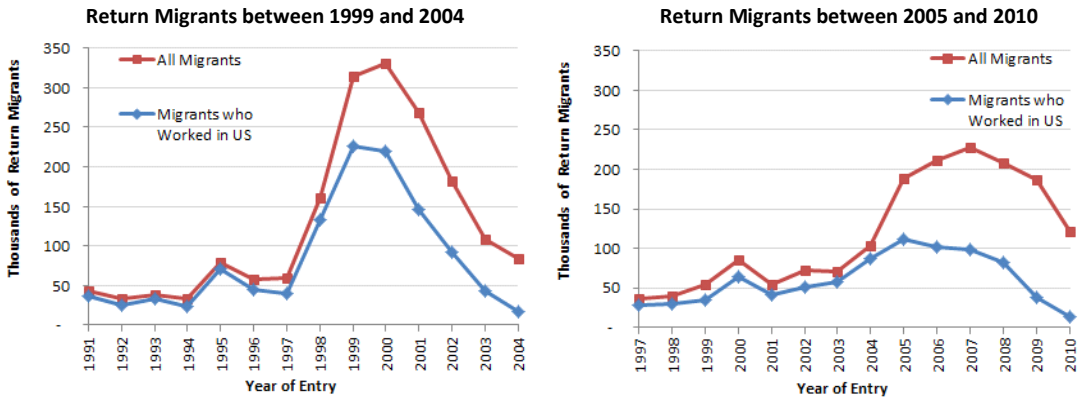
	Returned Migrants who Worked in the United States							
	Entered the US between 1993-2004 and Returned to Mexico between 1999-2004				Entered the US between 1999-2010 and Returned to Mexico between 2005-2010			
Variable	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
Married	0.633	0.482	0	1	0.567	0.495	0	1
Family in US	0.683	0.466	0	1	0.800	0.400	0	1
Age	31.4	8.7	15	75	30.6	8.8	15	89
Undocumented	0.848	0.359	0	1	0.891	0.312	0	1
Years of schooling	6.9	3.5	0	19	7.9	3.2	0	19
Duration in US (months)	29.4	27.1	0.03	139	39.6	33.9	0.07	144
Sent remittances last month	0.477	0.500	0	1	0.730	0.444	0	1
For investment	0.036	0.187	0	1	0.032	0.175	0	1
For consumption	0.440	0.496	0	1	0.698	0.459	0	1
Observations	4,237				5,623			
Sum of weights	1,088,361				781,468			

Figure 13: Return Migrants by Year of Return



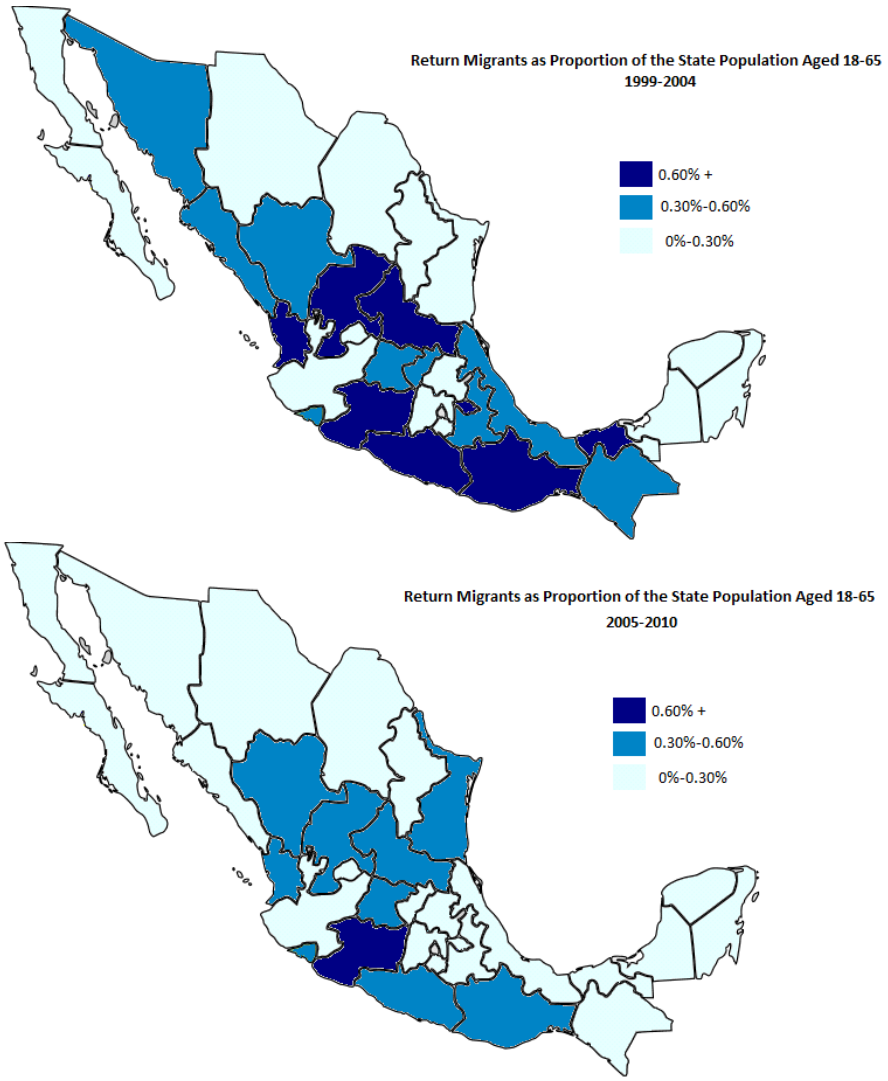
Source: EMIF

Figure 14: Return Migrants by Year of Entry



Source: EMIF

Figure 15: Yearly Return Migration Rates as Proportion of the State Population



or if they were not successful finding a job in the US), migrants who enter the US and get a job stay on average 33 months in the United States before they decide to return to Mexico. Figure 13 shows the total number of return migrants between 1999 and 2010 by year of return. Between 1999 and 2004 the number of return migrants who return after staying a short period of time in the US decreases, however, starting in 2005 that number starts increasing again and represents in 2010 more than 50 percent of the total number of return migrants.

This issue is relevant since an increase in the total number of return migrants driven by an increase of individuals who spend only short periods of time in the United States will not increases the probability of self-employment in Mexico. Figure 14 shows the total number of return migrants between 1999 and 2004 and between 2005 and 2010 by year of entry, and the number of migrants who return to Mexico after working in the United States.

Figure 15 shows the average number of return migrants per year as proportion of the state population aged 18-45 for the period 1999-2004 and 2005-2010. Over time there has been a decrease in the number of return migrants as proportion of the total population. The average for all states went from 0.40% between 1999 and 2004 to 0.26% between 2005 and 2010. It is important to note that Figure 15 only includes return migrants who worked in the United States. Including all return migrants might give very different results especially for states in Southern Mexico (Tabasco, Oaxaca, Quintana Roo, Veracruz, Puebla, and Chiapas), states that historically have had low migration rates, and therefore, do not have large migration networks in the United States.

4.4 SELF-EMPLOYMENT AND RETURN MIGRATION IN MEXICO

I use the 2010 Mexican Census to analyze what is the relationship between self-employment, return migration and earnings. Table 23 shows average wages, self-employment and unemployment rates in Mexico, and Table 24 shows regression results. The findings show that return migrants are more likely to be self-employed. Self-employed workers earn lower wages than wage-workers, and that finding is especially strong among non-return migrants. Addi-

Table 23: Average Earnings, Self Employment and Unemployment in Mexico

Log Hourly Wages

	Wage workers	Self-employed	All
Non_migrants	3.127	2.984	3.092
Migrants	3.182	3.201	3.187
All	3.128	2.987	3.093

Self-employment

Non_migrants	23.30%
Migrants	25.36%
All	23.33%

Unemployment rate

Non_migrants	5.26%
Migrants	10.57%
All	5.33%

tionally, return migrants earn higher wages than the average Mexican population, and that finding is especially strong among self-employed return migrants.

The regressions shown in Table 24 include fixed effects by state and standard errors are clustered at the state level. Controls for individual characteristics include age, years of schooling, marital status, experience and a dummy variable for individuals living in rural areas. In regressions 5 and 6 I exclude the agricultural sector given that, as has been documented in previous studies[2], international migration and return migration have little influence on the choice of farm self-employment.

Table 24, column one shows that return migrants are 3.37 percentage points more likely to be self-employed than the rest of the population. Relative to hourly earnings, columns 3 and 4 show that self-employed earn on average wages 7.42 log points less than wage-workers and that return migrants earn wages 5.79 log points more than the average Mexican worker. Column 5 shows that when we split self-employed workers into return migrants and non-return migrants we observe lower earnings associated with self-employment are only present among non-return migrants. If I analyze the wages from the perspective of return migrants the higher wages associated with return migration are received mainly by self-employed workers.

Finally, column 6 shows a regression where the dependent variable is unemployed. The results show that return migrants are 3.76 percentage points more likely to be unemployed.

[2]Ilahi, N. (1991).

Table 24: Regression Results

VARIABLES	(1) Self_employed	(2) Log_w age	(3) Log_w age	(4) Log_w age	(5) Log_w age	(6) Unemployed
Self_employed		-0.1318***	-0.0742***	-0.0763***	-0.0686***	
		(0.0303)	(0.0151)	(0.0151)	(0.0114)	
Return Migrant	0.0337***			0.0579*	0.0659*	0.0376***
	(0.0070)			(0.0330)	(0.0386)	(0.0042)
Self_employed*Return_migrant				0.1211***	0.1027**	
				(0.0353)	(0.0450)	
Constant	0.0759***	3.0727***	1.0836***	1.0821***	1.0952***	0.1128***
	(0.0241)	(0.0075)	(0.0502)	(0.0503)	(0.0541)	(0.0073)
Observations	773,677	549,719	549,719	549,719	455,945	563,054
R-squared	0.0756	0.0508	0.3105	0.3107	0.2931	0.0295
Controls for individual characteristics	Yes	No	Yes	Yes	Yes	Yes
Controls for Occupation	No	No	Yes	Yes	Yes	No
Includes Agricultural Sector	Yes	Yes	Yes	Yes	No	No

[1]Individual controls include: years of schooling, marital status, age, experience, and rural.

* Significant at the 10% level, ** Significant at the 5% level, ***Significant at the 1% level.

All regressions include fixed effects by state and standard errors clustered by state.

4.5 EMPIRICAL SPECIFICATION

In this paper I exploit the variation in return migration rates to different states of Mexico in two different periods of time to assess the impact of return migration on self-employment. I estimate the following OLS regression:

$$Self\_employed_{ist} = \alpha_s + \beta_t + \gamma ret\_mig_{st} + \delta X_{ist} + \eta Z_{st} + \lambda Occupation_{ist} + \varepsilon_{ist} \quad (4.1)$$

where $Self\_employed_{ist}$ is a dummy variable equal to 1 if individual i, from state s, who is observed in year t is self-employed, α_s are state fixed effects, β_t are year fixed effects, ret_mig_{st} is the return migration rate to state s in period t, X_{ist} is a vector of individual characteristics (such as age, age squared, years of schooling, experience, experience squared, and dummy variables for married workers and for different regions of origin in Mexico), Z_{st} is a vector of time varying controls (such as the logarithm of the state GDP and the logarithm of the average state wages), $Occupation_{ist}$ includes dummy variables for individuals working in different sectors (construction, manufacturing, commerce, services and others), and finally ε_{ist} is an error term.

Since the decision to return to a specific Mexican state may depend also on unobservable state characteristics that will likely influence the outcome of interest, the coefficient γ may

be biased. For example, if there is selectivity of return migrants, if there are differences in the distribution of entrepreneurial abilities of workers who decide to stay in the US and workers who return to Mexico, or if there exist differences in the entrepreneurial incentives faced by individuals returning to different Mexican states.

If return migrants are positively selected in terms of their entrepreneurial abilities, OLS results may overestimate the real effect, and underestimate it if return migrants are negatively selected. Additionally, if migrants decide to return to states that provide their citizens education and incentives to create businesses and become self-employed, the OLS results may overestimate the real effect. On the other hand, if individuals decide to migrate from and return to states in which citizens face difficulties and barriers to enter self-employment, the OLS results may underestimate the effect of return migration on the self-employment rates across Mexican states. One solution to this particular problem is the use of an instrument that predicts return migration but exerts no impact on the outcome variable.

I use as instrument for return migration a predicted rate of return using migration rates observed in the past for individuals from different Mexican states. I analyze two periods of time, first I estimate the effect of return migration between 1999 and 2004 on the decision to become self-employed, and then for the period between 2005 and 2011. In order to predict the return migration rates to different Mexican states during the first period of time (1999-2004) I use the migration rates observed between 1993 and 1999, and for the second period of analysis (2005-2010) I use the migration rates observed between 1999 and 2004.

The predicted return migration rates for the period between 1999 and 2004 are calculated as follows:

1. Find the likelihood that an individual surveyed by the EMIF, who migrated between 1993 and 1998, and worked in an specific state in the US, was born in a particular state of Mexico.
2. Estimate the total number of return migrants between 1999 and 2004 by state of residence in the United States. The number of return migrants is calculated restricting the sample to include individuals and who entered the United States between 1993 and 2004 and had a job in the United States.

3. Using the probability that an individual residing in an specific state of the US was born in a particular state of Mexico calculated in part 1, and the total number of return migrants by state of residence in the US calculated in part 2, I predict the number of return migrants from each state in the United States that will return to different states in Mexico.
4. Estimate the number of return migrants per year to each Mexican state.
5. Calculate the number return migrants as proportion of the total population aged 18 to 65 of each state of Mexico according to the 2000 Mexican Count of Population and Housing.

In order to estimate the predicted return migration rates for the period between 2005 and 2010 I follow steps 1 through 5 using the sample of immigrants surveyed by the EMIF who migrated between 1999 and 2004 for step 1, the number of return migrants between 2005 and 2010 who entered the US between 1999 and 2010 for step 2, and data from the 2000 Mexican Count of Population and Housing for step 5. Finally, equation 4.1 is estimated using the predicted return migration rates as instrument.

The OLS and IV regressions are estimated restricting the sample to include males who are part of the labor force, who were born in Mexico, and are aged 18 to 45. Additionally, I restrict the sample to include only individuals working in non-agricultural activities in urban areas, and include only individuals who became self-employed or who took a wage work during the 5 years prior to the time of the survey.

4.6 RESULTS

The top panel of Table 25 shows the OLS regression results. An increase of one percent in the number of return migrants as proportion of the total population (aged 18-45) increases self-employment between 1.6 and 2.1 percentage points. It is important to note that these magnitudes are considerably small and all the specifications are only statistically significant at the ten percent level.

The results using OLS regression can be potentially biased if the decision to return to a

particular state in Mexico may depend also on unobservable individual characteristics that will likely influence the outcome of interest. I address this concern by using as instrument for return migration a predicted rate of return using migration rates observed in the past for individuals born in different states of Mexico. In the first stage regression the coefficient on the instrument is -0.38 with a standard error of 0.004, and a t-statistic of -104.

It is important to note that the sign of the first stage is negative, which implies that return migrants are more likely to be from states with low migration rates. This result implies that return migration is not a random process. States with high migration rates are likely to have larger migration networks in the US, which would contribute to have longer and more permanent migrations. Additionally, towns with larger migration rates also have higher probability of family migration (individuals are more likely to migrate with family members) which also would decrease their probability to return to Mexico.

The second stage results are shown in the bottom panel of Table 25. These results, while still small in magnitude, are larger than the ones obtained using OLS and are statistically significant at the 5 and 10 percent level. An increase of one percent in the number of return migrants as proportion of the total population would increase self-employment between 12.0 and 13.0 percentage points. A one percent increase in the number of return migrants as proportion of the total population represents a 100% increase in the number of return migrants in the states with the highest ratios of return migrants to total population[3].

If I transform the variables into standard deviations, the coefficient shows that an increase of one standard deviation in the return migration rate leads to a 0.089 standard deviation increase in self-employment.

If I use the average values of migration rate and self-employment, these results imply that an increase of 3,465 migrants (one standard deviation in the return migration rate) will increase the self-employment by 0.089 standard deviations or 2.75 percentage points.

These results seem to be in line with the literature that has found small but significant effect of return migration and remittances on investment and the probability of becoming

[3]If we consider that the number of return migrants as proportion of the total population across states is on average 0.33% during the period of analysis, the result suggests that an increase of 300% in the number of return migrants would generate a 13% increase in the self-employment rate in Mexico.

Table 25: Regression Results

I. OLS Results				
Dependent variable: Self-employment	(1)	(2)	(3)	(4)
Return Migrants/Population	0.017*	0.016*	0.014	0.021*
	(0.0090)	(0.0090)	(0.0110)	(0.0120)
Observations				
Includes year fixed effects	Yes	Yes	Yes	Yes
Includes state fixed effects	Yes	Yes	Yes	Yes
Includes individual controls	No	Yes	Yes	Yes
Includes time varying controls	No	No	Yes	Yes
Includes controls for job characteristics	No	No	No	Yes
Sample weights	Yes	Yes	Yes	Yes
II. Instrumental Variables Result				
Dependent variable: Self-employment	(1)	(2)	(3)	(4)
Return Migrants/Population	0.126*	0.124*	0.117**	0.130**
	(0.0710)	(0.0700)	(0.0530)	(0.0560)
Observations	64,676	64,512	64,512	64,512
Includes year fixed effects	Yes	Yes	Yes	Yes
Includes state fixed effects	Yes	Yes	Yes	Yes
Includes individual controls	No	Yes	Yes	Yes
Includes time varying controls	No	No	Yes	Yes
Includes controls for job characteristics	No	No	No	Yes
Sample weights	Yes	Yes	Yes	Yes
First Stage Instrumental Variable				
Dependent variable: Return Migrants/Population	(1)	(2)	(3)	(4)
Instrument	-0.3538***	-0.3544***	-0.3835***	-0.3834***
	(0.0046)	(0.0046)	(0.0037)	(0.0037)

* Significant at the 10% level, ** Significant at the 5% level, *** Significant at the 1% level.

Individual controls include age, age squared, married, years of schooling, experience, experience squared, region of origin in Mexico.

Time varying controls include log GDP and log wages.

Job characteristics include dummy variables for different industries: costruction, manufacturing, comerce, services and others.

Standard errors are clustered at the state by year level.

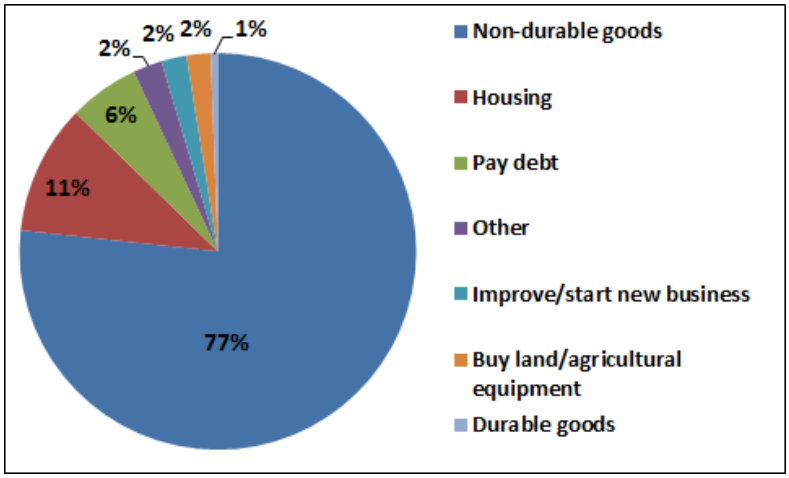
self-employed. That occurs when remittances tend to be disproportionately used for consumption and non-productive investment. If remittances are primarily spent in conspicuous consumption and non-productive investments, return migration may be conducive of increases in leisure among household members. Another explanation, supported by Murillo Castaño (1988) in his study of Colombian return migrants from Venezuela is that savings (remittances) are used to establish, or expand self-employment activities but only after basic needs of the household members have been satisfied. Therefore, if return migrants are spending remittances satisfying the basic needs of their families, the effect on investment and self-employment would be very limited.

In order to verify if those arguments are valid for the case of Mexican return migrants, I use data on the uses of remittances reported by workers surveyed by the EMIF. I restrict the sample to include only return migrants who entered the US and returned to Mexico between 1993 and 2010 and sent remittances during their last month in the United States (50% of the migrants who returned between 1993 and 2003 sent remittances during their last month in the US and 70% of those who returned between 2005 and 2010).

It is important to note that the information on uses of remittances has to be interpreted carefully. The survey inquires migrants about the use of remittances they sent the month prior they returned to Mexico. I do not have information of the use of remittances for those individuals who did not send remittances and who brought their remittances with them when they return to Mexico. Individuals who know they will return within one month, might prefer to bring the money with them instead of paying fees to send the remittances. Therefore, if individuals planning to invest remittances upon return are also more likely to bring the remittances with them, then these results might underestimate the likelihood of using remittances for investment purposes. However, if that is the case, we can still see from these data that over time a larger proportion of workers sent remittances the month before they returned to Mexico, which implies that over time, the proportion of migrants using remittances for consumption rather than for investment purposes has increased.

As Figure 16 shows, a large number of return migrants report that remittances are used for consumption. While 77% of the migrants reported that remittances were spent on the

Figure 16: Use of Remittances among Migrants who Returned to Mexico between 1993 and 2010



consumption of non-durable goods and rent payments, 11% reported remittances are spent on housing (purchases and improvements), 6% to pay previous debts, and 2% to buy durable goods. On the other hand, only 2% of the migrants reported that remittances are used to improve or start a new business and 2% to buy land or agricultural equipment. These findings might explain the small magnitudes obtained in the regression analysis and suggest further lines of research studying not only return migration patterns, but also incorporate amounts and uses of remittances in different states of Mexico over time.

4.7 CONCLUSIONS

I study the effect of return migration on self-employment in different states of Mexico over time. Return migration may enhance the asset positions and productivity levels of Mexican households via remittances, savings, and human capital accumulation, and thus, enable migrants to set up their own businesses upon return, overcoming poverty and relaxing credit constraints due to absent or incomplete credit markets.

In this paper I exploit the variation in return migration rates to different states of Mexico in two different periods of time to assess the impact of return migration on self-employment.

I estimate OLS regressions and in order to avoid potential endogeneity issues I also use instrumental variables. I use as instrument for return migration a predicted rate of return using migration rates observed in the past in different Mexican states.

Using instrumental variables the results show that return migration exerted a positive but small impact on the probability of creating non-farm business in Mexico between 1999 and 2011. An increase of one percent in the number of return migrants measured as proportion of the state population increases the probability of being self-employed by 13 percentage points.

The results seem to be in line with the literature that has found very small effect of return migration and remittances on investment and the decision to become self-employed which occurs when remittances tend to be disproportionately used for consumption and non-productive investment. In order to verify if those arguments are valid for the case of Mexican return migrants, I use data on the uses of remittances reported by workers who returned to Mexico between 1993 and 2010. The evidence shows that remittances are used predominantly for consumption purposes. While 77% of the return migrants reported that remittances were spent on the consumption of non-durable goods and rent payments, 11% reported were spent on housing, 6% to pay previous debts, and 2% to buy durable goods. On the other hand, only 2% of the migrants reported that remittances were used to improve or start a new business and 2% to buy land or agricultural equipment. These findings might explain the small magnitudes obtained in the regression analysis and suggest further lines of research studying not only return migration patterns, but also the amount of remittances and the uses of remittances in different states of Mexico over time.

5.0 DRUG VIOLENCE AND MIGRATION FLOWS

5.1 MOTIVATION

In recent years, Mexico has experienced a dramatic surge in homicides driven in large part by the violent struggle between and within powerful criminal organizations to control the lucrative drug trade business. Efforts by President Felipe Calderon's administration to combat organized crime have resulted in a significant increase in killings. Between 2006 and 2011, 47,515[1] killings were officially linked to organized crime, a dramatic increase from the 8,901 killings recorded under President Vicente Fox's administration (2000 - 2006).[2] While there is consensus that drug violence has had social, economic and political impact, little research has been devoted to study the effect of violence on the migratory patterns of Mexican workers.

During the period of 2006-2012 the number of Mexican immigrants in the US decreased significantly. According to Passel et al. (2012), in 2010 for the first time in four decades the net flow of immigrants from Mexico to the United States was zero. Some of the factors that could have contributed to the change in the migratory behavior of Mexican immigrants are the recession suffered by the United States since 2008, the creation of unfavorable State immigration laws for undocumented immigrants, and the increase in violence generated by the war against drug trafficking in Mexico.

Violence can affect the inflows and outflows of migrants; however, it is not clear in which direction the effects go. Violence creates a social and economic burden on societies, and

[1] Estimates from December 2006 to September 2011. Source: ENVIPE.
[2] Rios V., Shirk D. (2011).

impacts not only individuals or businesses, but also the larger economy. Estimates suggest that the annual cost of violence in Mexico is between 1.0 and 1.5% of GDP,[3] it decreases foreign direct investment, domestic investment, and personal consumption, but can also affect individuals' earnings, job performance or the ability to keep a job.

Additionally, violence imposes significant emotional costs on individuals. Violence generates displacement; individuals tend to migrate in order to find safer environments for them and their families. It is documented that US cities in the southern border have seen a relative increase of middle-class Mexican migration associated to the increase in violence in Mexico (Arceo-Gomez (2012) and Becker (2009)).

The increase in violence could have also changed the emotional cost of being away, increasing the cost for migrants who leave their families back in Mexico who perceive their family members might be at risk; and decreasing the cost of migrants who migrate with their families to the US and now feel that Mexico is not a good place to be.

Migration costs could have also increased with violence. During the last years criminal gangs have come to control smuggling routes into the United States and migrants are frequently subjects of abuses including assault, extortion, theft, and death at the hands of those violent criminal groups.[4]

In this chapter I study the effect of drug-violence on the outflow of immigrants from Mexico to the United States. I exploit the variation in violence across municipalities over the period of 2007-2011 using data of homicides due to rivalry between delinquent organizations and data on Mexican migration from the Surveys of Migration to the Northern Border (EMIF).

The results show that the increase in violence affects differently the outflows of migrants

[3] According to JP Morgan the annual cost of violence in Mexico is estimated to be between 1 and 1.5% of GDP. BBVA Bancomer also estimated the cost between 1 and 1.5% of GDP. INEGI estimated that the cost in 2010 was 1.53% of the GDP using the ENVIPE for 2011. Excelsior (09/06/2011): "JP Morgan revela que la violencia en México cuesta 1.5% del PIB". http://www.excelsior.com.mx/2011/06/09/dinero/743660.

[4] The Mexican government has advised migrants driving home from the US for the winter holidays to form convoys for their own protection inside Mexico and to travel only during daylight hours. The interior ministry said the Mexican army could provide escorts to protect convoys from attacks of criminal groups. Source: "Mexico migrants told to form convoys," BBC, Nov 22, 2010. http://www.bbc.co.uk/news/world-latin-america-11815381

from different regions of Mexico. While an increase in violence is associated with an increase in the outflows of migrants from Western Mexico, it is also associated with a decrease in the outflows of individuals from Southern Mexico. An increase of 1 death per 10,000 inhabitants increases migration rates from municipalities of Western Mexico by 0.06 percentage points, but decreases migration rates from municipalities of Southern Mexico by 0.10 percentage points.

Similarly, when I use the sample of migrants caught by the Border Patrol and study their probability of re-entry, an increase of 1 death per 10,000 inhabitants in their municipality of origin increases the probability to try to re-enter the US by 0.43 percentage points for individuals from Western Mexico, but decreases the probability to try to re-enter by 0.33 percentage points for migrants from Southern Mexico.

One factor that could explain the differences in the behavior of workers from Western and Southern Mexico is having different costs associated with the increase in violence, for example, if individuals from different regions of Mexico suffer different changes in earnings or migration cost. In order to test for such differences I use Mexico's 2011 and 2012 National Survey on Victimization and Perceptions of Public Safety (ENVIPE). This survey provides estimates of the number of crime victims, economic losses due to crime, as well as perceptions of public safety at the national and sub-national levels. The results show that individuals from Western Mexico feel more unsafe in their own municipality and have higher losses due to crime. Therefore, the high costs associated with increases in violence could have contributed to the increase in the outflow of workers from that region of Mexico.

5.2 LITERATURE REVIEW

Most of the research studying the effect of the increase in violence on the behavior of Mexican migrants has analyzed how US cities on the US-Mexico border have seen a relative increase of middle-class Mexican migration (Arceo-Gomez (2012)). Unlike the traditional job-seeking migrants, this new migrant class comprises business owners, executives and other professionals who have established new businesses in US cities creating jobs and investing in

high-unemployment areas (Becker (2009), Nickell J.K. (2013)).

To my knowledge, there is no rigorous research documenting the change in the migratory behavior of individuals at the national level. In this paper I study the outflow of migrants from all states of Mexico to all states of the US.

Theoretically, it is not clear what is the effect of violence on the outflows and inflows of migrants. The neoclassical theory of migration focuses on wage differentials and migration costs. It generally conceives migration as an individual decision for income maximization. Borjas (1987) develops a two-country model following Roy's (1951) "Thoughts on the Distribution of Earnings'." In Borjas' model, also known as Borjas' selection model, an individual migrates if expected earnings at destination ($w_{US}^{\exp}$) net of migration costs (MC) are higher than earnings at home (w_{Mex}).[5] Therefore, if an increase in violence decreases expected earnings of individuals in Mexico, the theory predicts that more individuals will find it optimal to migrate increasing the outflows of workers to the United States.

Furthermore, violence could also increase migration costs. Migration costs include not only monetary costs such as transportation costs (TC) and the subsistence cost for the migrant in the host country while he finds a job, but also non-monetary costs such as the emotional cost of being away from family (EC) as pointed by Taylor (1996), or what Sjaastad (1962) calls the "psychic" cost of changing one's environment. According to the neoclassical theory of migration, an increase in migration costs would decrease the number of individuals who migrate to the US.

5.3 DATA

In this paper I use quarterly data on drug-related homicides at the municipal level. This data is compiled by a committee with representatives from all ministries who are members of the National Council of Public Security (Consejo Nacional de Seguridad Publica). This committee classifies which homicides are drug related. Drug-related homicides are defined as any instance in which a civilian kills another civilian, with at least one of the parties

[5] Borjas' model only considers monetary costs of migration. In Figure 1 I include monetary (transportation) costs and non-monetary (emotional) migration costs.

Table 26: Municipalities with the Highest Drug-related Homicide Rates

Drug-related Homicides per 10,000 inhabitants			
Municipality	**State**	**Total 2007-2011**	**Monthly Average**
Guadalupe	Chihuahua	428	7.1
Mier	Tamaulipas	366	6.1
General Treviño	Nuevo León	273	4.5
Praxedis G. Guerrero	Chihuahua	271	4.5
Sáric	Sonora	208	3.5
Guerrero	Tamaulipas	192	3.2
Doctor Coss	Nuevo León	169	2.8
Matamoros	Chihuahua	152	2.5
Arizpe	Sonora	140	2.3
Santa Catarina	Nuevo León	134	2.2
National		**3.97**	**0.07**

involved in the drug trade. Additionally, the committee also maintains a database of how many people have been killed in armed confrontations between authorities and organized criminals. The dataset includes information for 1,167 municipalities between 2007 and 2011. Table 26 and Figure 18 show the summary statistics and distribution of the number of drug-related homicides per 10,000 inhabitants between 2007 and 2011. It is important to mention that even though the government could have incentives to underreport the number of killings and therefore, minimize the problem of violence that Mexico is suffering; different private organizations have found independently similar totals.[6]

Data on Mexican migrants is from two sections from the EMIF, the Northward-bound section and the section of migrants returned by the Border Patrol conducted between 2008 and 2011.I use two sub-samples of the EMIF. The first one is used to calculate a proxy for migration rates from Mexican municipalities to the United States (see chapter 1 for more details). Figure 19 shows the average migration rates estimated between 2008 and 2011. The second sample is used to estimate the probability of re-entry for workers returned to Mexico by the Border Patrol. Summary statistics are shown in Table 27.

[6]The newspaper El Universal counted between December 2006 and July 2009 12,480 drug related deaths, while the National Council of Public Security reported 14,730. http://www.eluniversal.com.mx/estados/72681.html

The newspaper Milenio counted between December of 2006 and December of 2012 58,000 drug related deaths (an average of 805 deaths per month). The National Council of Public Security reported 47,515 but only between December of 2006 and September of 2011 (an average of 819 deaths per month). http://www.milenio.com/cdb/doc/impreso/9165950

Figure 17: Average Monthly Drug Trade Related Homicides per 10,000 Inhabitants (2007-2011)

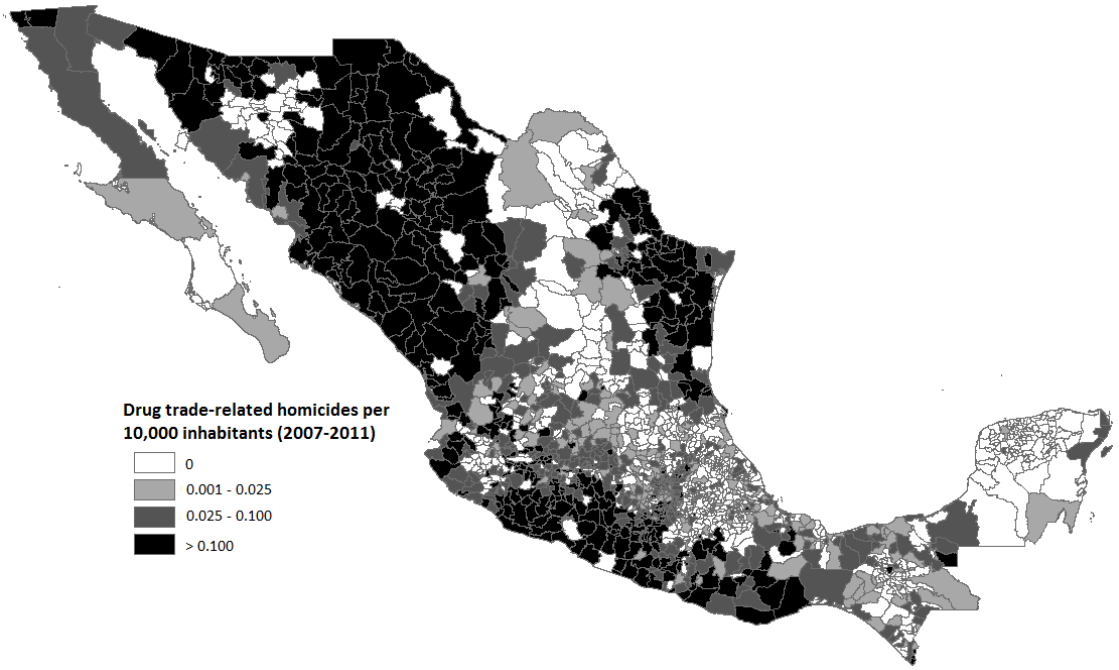


Figure 18: Average Yearly Migration Rates between Mexico and the United States (2008-2011)

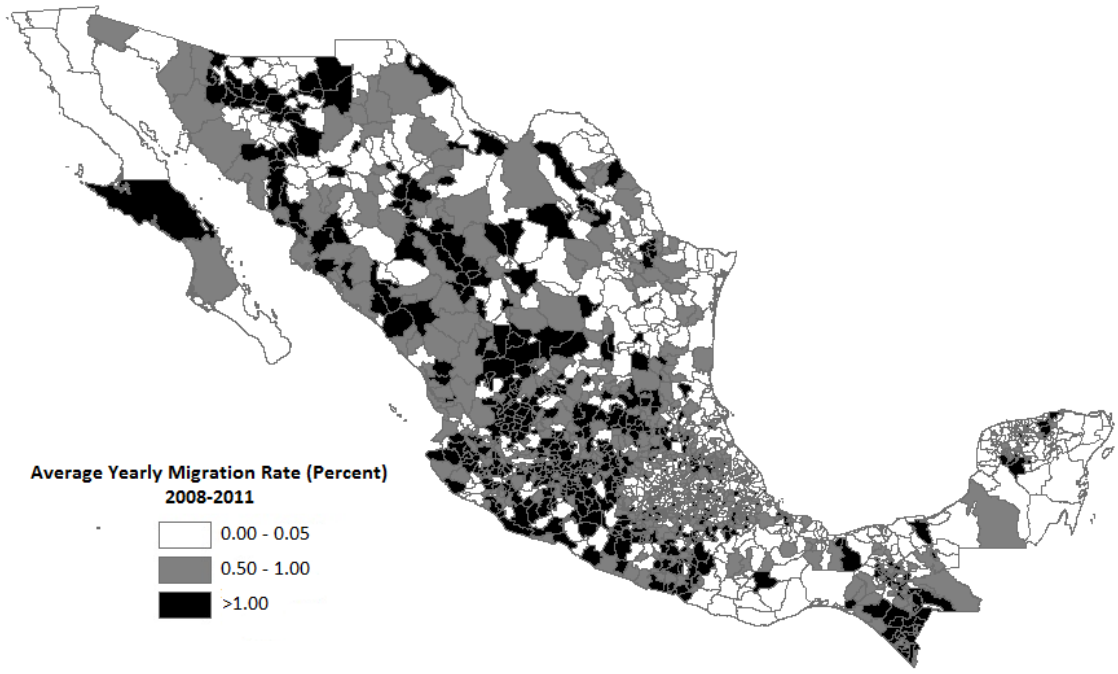


Table 27: Summary Statistics: Migrants Returned by the Border Patrol

Variable	Mean	Std. Dev.	Min	Max
Age	29	8.8779	14	81
Years of schooling	7.68	2.8204	0	18
Married	0.58	0.4943	0	1
With family in the US	0.40	0.4898	0	1
Intention to reenter to the US	0.72	0.4508	0	1
Duration in the U.S. (years)	1.76	4.3814	0	46
Caught crossing at the border	0.59	0.4920	0	1
Previous migration experience	0.28	0.4494	0	1
State of Aprehension				
Arizona	0.46	0.4985	0	1
Texas	0.05	0.2262	0	1
California	0.13	0.3338	0	1
Region of Origin (Mexico)				
Northern	0.17	0.3736	0	1
Southern	0.25	0.4326	0	1
Central	0.28	0.4499	0	1
Western	0.30	0.4588	0	1
Observations	23,915			

Finally, in order to verify if the cost of violence is different for individuals from different regions of the country I use Mexico's 2011 and 2012 National Survey on Victimization and Perceptions of Public Safety (ENVIPE). This survey provides estimates of the number of crime victims, economic losses due to crime, as well as perceptions of public safety at the national and sub-national levels.

5.4 EMPIRICAL SPECIFICATION

5.4.1 Effect of Violence on the Outflows of Migrants: Sample of Migrants who Intend to Enter the US

In order to study the effect of the increase in drug-related violence on the outflows of migrants from Mexico to the United States I use two different sub-samples. The first survey is conducted among migrants in border cities who left their hometowns and moved to the US-Mexico border with intention to cross into the US to work or look for a job. Using this dataset I test how the increase in violence is associated with changes in migration rates in their municipality of origin. I use data of migrants from the EMIF between 2008 and 2011, and data of population from the 2010 Mexican Census to construct migration rates at the municipality level over time and run the following regression:

$$Migration\_rate_{mt} = \alpha_m + \beta_t + \gamma_1 deaths_{mt-1} + \varepsilon_{mt}$$

where $Migration\_rate_{mt}$ is the number of migrants from municipality m in year t as a proportion of the municipal population, $deaths_{mt-1}$ is the number of homicides committed in municipality m between 2007 and year $t-1$ per 10,000 inhabitants, α_m are municipality fixed effects, β_t are year fixed effects, and ε_{mt} is an error term.[7]

It is important to note that individuals from different regions of Mexico have different characteristics, and therefore, might have been affected differently by changes in violence. For example, municipalities from western Mexico have been traditionally source of migrants.

[7] The EMIF is not responded by migrants who reside in the border cities where the surveys are conducted. Therefore, the migration rate for most of these municipalities is underestimated. For that reason, I eliminated from the regression all the municipalities located within 100 kilometers of the U.S.-Mexico border.

Workers from those regions have larger migration networks at destination, are more likely to have a job in the US prior to migration, and are more likely to have migratory experience. Therefore, migrants from Western Mexico might have a different sensitivity relative to individuals from other regions.

In order to account for the different characteristics and risks faced by individuals migrating from different regions of Mexico I also run a model with municipality fixed effects (α_m), year fixed effects (β_t) and interactions of $deaths_{mt-1}$ and dummy variables for four regions of Mexico: Northern, Central, Southern and Western Mexico.[8]

$$\begin{aligned} Migration\_rate_{mt} &= \alpha_m + \beta_t + \gamma_1 deaths_{mt-1} * Northern + \\ &\quad \gamma_2 deaths_{mt-1} * Central + \gamma_3 deaths_{mt-1} * Southern + \\ &\quad \gamma_4 deaths_{mt-1} * Western + \varepsilon_{mt} \end{aligned} \tag{5.1}$$

One factor that could affect the migration decisions of individuals is the violence on the roads to the US-Mexico border. It has been reported that during the last years criminal groups have targeted migrants on their way to the border to kidnap them or force them to work in their criminal organization. The most dangerous trajectories that migrants have to cross before reaching the United States are the ones that go through the states of Tamaulipas, Durango, Veracruz and Nuevo Leon. Hence, it is important not only account for the violence suffered in their hometowns, but also consider the risks faced during their trip to the US.[9]

Another factor likely to influence the probability of migration is the possibility to migrate with the family. If migrants have to leave their families back in Mexico, an increase in violence can significantly increase the emotional cost of being away, therefore, affecting the probability to migrate.

[8] I divide Mexico into four regions. These regions were specified following the definition of the Mexican National Population Council (CONAPO) who grouped states according to their geographical and migratory characteristics. Northern Mexico: Baja California Norte, Baja California Sur, Sonora, Sinaloa, Chihuahua, Coahuila, Nuevo Leon and Tamaulipas. Western Mexico: Aguascalientes, Colima, Durango, Guanajuato, Jalisco, Michoacan, Nayarit, San Luis Potosi and Zacatecas. Central Mexico: Morelos, Queretaro, Tlaxcala, Puebla, Hidalgo, D.F., and Estado de Mexico. Southern Mexico: Campeche, Chiapas, Guerrero, Oaxaca, Quintana Roo, Tabasco, Veracruz and Yucatan.

[9] Individuals from municipalities in the same region of Mexico are likely to use the same roads (e.g. migrants from Southern Mexico are likely to cross the states of Veracruz and Tamaulipas in their trip to the border, while migrants for Western Mexico have to cross Zacatecas, Coahuila, and Nuevo Leon to arrive to the U.S.)

Finally, another factor that can influence individuals' decision to migrate is the economic loss associated with the increase in violence. If violence decreases individuals' earnings and increases the costs to protect their families, an increase in violence will increase the probability to migrate.

In order to test the effect of violence on the roads, the effect of violence on the probability to migrate of individuals from municipalities in which family migration is more likely to occur, and how violence affects the probability to migrate of individuals who can potentially have large economic losses due to violence, I run the following regression:

$$\begin{aligned} Migration\_rate_{mt} &= \alpha_m + \beta_t + \gamma_1 Index\_road\_violence_{mt} + \\ &\quad \gamma_2 Family\_migration_{mt} + \gamma_3 deaths_{mt-1} + \\ &\quad \gamma_4 Family\_migration_{mt} * deaths_{mt-1} + \\ &\quad \gamma_5 \log wage_{mt} + \gamma_6 \log wage * deaths_{mt-1} + \varepsilon_{mt} \end{aligned} \tag{5.2}$$

where α_m are municipality fixed effects, β_t are year fixed effects, $Family\_migration_{mt}$ is the proportion of migrants from municipality m who migrate with immediate family (mother, father, spouse, sons and daughters) at time t, $Index\_road\_violence_{mt}$ is an index measuring the violence on the roads that migrants will face in their way to the border, and finally, $logwage_{mt}$ is the logarithm of the average hourly wage of municipality m at time t. In this regression I also include average unemployment rate by municipality, and to control for the size of migration networks I include the proportion of the migrants from each municipality with previous migratory experience and the proportion of migrants who already have a job in the US at the time of migration. In this regression standard errors are clustered by state.

The index of violence on the road is calculated as follows. First I find the closest route from each municipality to the closest port of entry to the US. Once I identify the states that each migrant will cross, I construct weights using the surface of each state to account for the share of the trip that occurs in each of the states crossed. Then, using the weights and the number of deaths as proportion of the population for each state I calculate a weighted number of deaths observed during the trip. Finally, I multiply the weighted number of deaths by the total distance (in thousands of miles) from the municipality of origin to the closest crossing point.

5.4.2 Effect of Violence on the Outflows of Migrants: Sample of Migrants returned by the Border Patrol

The second survey used to study the effect of violence on the outflows of migrants from Mexico to the United States is conducted among individuals returned to Mexico by the Border Patrol. The US government deports hundreds of thousands of illegal immigrants to Mexico each year,[10] they are dropped just across the border, and the majority of them will immediately try to cross back into the US.[11]

This survey is used to study the outflows of migrants to the US by testing how the probability to re-enter is affected by the violence in Mexico. I run the following regression:

$$Re\text{-}enter_{imt} = \alpha_m + \beta_t + \gamma deaths_{mt-1} + \delta X_{it} + \varepsilon_{imt} \tag{5.3}$$

where $Re\text{-}enter_{imt}$ is a dummy variable equal to 1 if individual i, from municipality m, who is observed in quarter/year t intends to re-enter the US; α_m are municipality fixed effects, β_t are quarter/year fixed effects, and $deaths_{mt-1}$ is the number of homicides committed in municipality m between the first quarter of 2007 and quarter $t-1$ per 10,000 inhabitants.

In this regression X_{it} is a vector of individual characteristics such as years of schooling, duration in the US, age, age squared, and dummy variables for married, with family in the US, previous migratory experience, state where immigrants were working when they were captured by the Border Patrol, and controls for the place where they were caught. Finally, ε_{imt} is an error term.

Additionally, I run the previous model with interactions of $deaths_{mt-1}$ and dummy variables for four regions of Mexico.

$$\begin{aligned} Re\text{-}enter_{imt} \;=\; & \alpha_m + \beta_t + \gamma_1 deaths_{mt-1} * Northern + \gamma_2 deaths_{mt-1} * Central \\ & + \gamma_3 deaths_{mt-1} * Southern + \gamma_4 deaths_{mt-1} * Western \\ & + \delta X_{it} + \varepsilon_{imt} \end{aligned} \tag{5.4}$$

[10] In FY 2012, U.S. Immigration and Customs Enforcement (ICE) removed 409,849 individuals http://www.ice.gov/removal-statistics/.

[11] Estimates of Schulkin (2012) show that a minimum of 46 percent of the 2011 deportees were previously deported and re-enter the United States.

Table 28: Effect of violence in the probability of Migrating to the U.S.

Dependent variable: Migration Rate			
	1	2	3
Deaths per 10,000 inhabitants	-0.00003	0.00014	-0.00008
	(0.0001)	(0.0001)	(0.0002)
Observations	3,178	3,178	3,178
FE per year	No	Yes	Yes
FE per municipality	No	No	Yes

* Significant at the 10% level, ** Significant at the 5% level,
***Significant at the 1% level.
The regressions include sample weights and standard errors clustered by state.

This sample of workers includes individuals who were caught while they were trying to enter the US, and workers who have been in the US for longer periods of time. The first group of workers (caught while trying to cross) will have similar characteristics to the workers studied in the previous section; however, the second group of workers (caught after being in the US for long period of time) will help us to understand if the effect of violence can change as duration in the US increases. In order to test for differences in the effect of violence as duration in the US increases I group migrants by time in the US (border crossers with country of residence Mexico, less than one year, between one and six years and more than six years in the US) and run regression five for each group of workers.

5.5 RESULTS

5.5.1 Effect of Violence on the Outflows of Migrants: Sample of Migrants who Intend to Enter the US

While the results in Table 28 show that violence does not seem to have a significant effect on the inflows of migrants, Table 29 gives us a different picture. The results show that the increase in violence affects differently the outflows of migrants from different regions of Mexico, especially Western and Southern Mexico. While an increase in violence is associated with an increase in the outflows of migrants from Western Mexico, it is also associated with a decrease in the outflows of migrants from Southern Mexico. The results show that an

Table 29: Effect of violence in the probability of Migrating to the U.S.

Dependent variable: Migration Rate			
	1	2	3
Deaths per 10,000 inhabitants* Northern	-0.0001	0.0000	0.0000
	(0.0001)	(0.0000)	(0.0000)
Deaths per 10,000 inhabitants* Southern	0.0002	0.0006**	-0.0010***
	(0.0002)	(0.0001)	(0.0001)
Deaths per 10,000 inhabitants* Central	-0.0028**	-0.0008	0.0015*
	(0.0008)	(0.0006)	(0.0005)
Deaths per 10,000 inhabitants* Western	0.0010**	0.0017***	0.0006**
	(0.0003)	(0.0002)	(0.0002)
Observations	3,178	3,178	3,178
FE per year	No	Yes	Yes
FE per municipality	No	No	Yes

* Significant at the 10% level, ** Significant at the 5% level, ***Significant at the 1% level.
The regressions include sample weights and standard errors clustered by region.

Table 30: Effect of violence in the probability of Migrating to the U.S.

Dependent variable: Migration Rate						
	1	2	3	4	5	6
Deaths per 10,000 inhabitants* Northern	-0.0001	0.0000	0.0000	-0.0002*	-0.0001	0.0001
	(0.0001)	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0000)
Deaths per 10,000 inhabitants* Southern	-0.0001	0.0002	0.0000	-0.0002	0.0001	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Deaths per 10,000 inhabitants* Central	-0.0019*	-0.0004	0.0012*	-0.0025**	-0.0011	0.0016*
	(0.0008)	(0.0006)	(0.0004)	(0.0007)	(0.0007)	(0.0005)
Deaths per 10,000 inhabitants* Western	0.0012**	0.0017***	0.0006**	0.0010**	0.0015***	0.0007**
	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Observations	3,058	3,058	3,058	4,615	4,615	4,615
FE per year	No	Yes	Yes	No	Yes	Yes
FE per municipality	No	No	Yes	No	No	Yes

* Significant at the 10% level, ** Significant at the 5% level, ***Significant at the 1% level.
The regressions include sample weights and standard errors clustered by region.

Table 31: Effect of violence in the probability of Migrating to the U.S.

Dependent variable: Migration Rate			
	1	2	3
Index_Violence in the roads	-0.0005***	-0.0005***	-0.0004**
	(0.0001)	(0.0001)	(0.0002)
Deaths per 10,000 inhabitants * Family migration	0.0001	0.0001	0.0002
	(0.0002)	(0.0002)	(0.0002)
Family migration	0.0119***	0.0119***	0.0108***
	(0.0017)	(0.0017)	(0.0028)
Deaths per 10,000 inhabitants*Log hourly wage	-0.0000	-0.0000	0.0002
	(0.0002)	(0.0002)	(0.0003)
Log hourly wage	-0.0058	-0.0058	-0.0001
	(0.0049)	(0.0049)	(0.0028)
Deaths per 10,000 inhabitants	0.0001	0.0001	-0.0008
	(0.0008)	(0.0008)	(0.0012)
Constant	0.0430**	0.0430**	0.0222**
	(0.0205)	(0.0205)	(0.0112)
FE per year	No	Yes	Yes
FE per municipality	No	No	Yes
Observations	3,178	3,178	3,178
R-squared	0.0254	0.0254	0.5847

*Significant at the 10% level, **significant at the 5% level, ***significant at the 1% level.

increase of 1 death per 10,000 inhabitants increases migration rates from municipalities of Western Mexico by 0.06 percentage points, but decreases migration rates from municipalities of Southern Mexico by 0.10 percentage points.

It is important to note that given that the analysis is at the municipality level, and that an important number of municipalities have relatively small populations, migration rates will have large variances driven by heterogeneity in town size.

According to the 2010 Census, in Mexico has 2,444 municipalities with a median population of 7,521 inhabitants and an average of 29,157. The results in Table 29 include only the municipalities for which there is available data on drug-related homicides at the municipal level. This sample includes relatively large municipalities, the median population for this sample is 16,683, and the average population is 54,833. It is important to note that while I only have information of violence of 47 percent of the municipalities in Mexico, these municipalities account for more than 88 percent of the total population of the country.

In Table 30, regressions 1 to 3 replicate the results from Table 29 but eliminate municipalities with less than 2,500 inhabitants. This restriction implies eliminating more than 40

percent of the municipalities of Southern Mexico. Table 30, regressions 4 to 6 replicate the results from Table 29 including all municipalities with more than 2,500 inhabitants[12]. The results from Table 30 show estimates similar to those obtained in Table 29 for all regions except for Southern Mexico.

Southern Mexico has 1,119 municipalities with a median population of 3,898 inhabitants and an average of 14,372. Therefore, imposing restrictions on the size of the population will mainly affect the results for that region of Mexico given the large number of municipalities dropped.

Table 31 shows the effect of violence on the roads, the effect of violence for municipalities where family migration is more likely to occur, and the effect of violence on individuals who can potentially have higher economic losses. The results show that more violence on the roads deters individuals from migrating. A unit increase in the index of violence on the roads decreases migration rates by 0.04 percentage points[13]. Table 31 also shows that municipalities in which migrants are more likely to migrate with their families have higher migration rates. While the coefficient of the interaction of violence and family migration has the expected sign (an increase in violence should increase migration more if an individual can migrate with his family since he will have lower emotional cost of being away), it is not statistically significant. With respect to earnings, the results show that the coefficients have the signs that we expected but are not statistically significant. While higher earnings in Mexico are associated with lower probability of migration, we can see that the interaction of violence and log wages is positive. These results suggest that an increase in violence will increase the likelihood of migration more for individuals with higher earnings since they can potentially have higher economic losses if they decide not to migrate.

[12] For the municipalities that I do not have information of drug-related homicides I assume the number is zero.

[13] The index has a mean of 4.9 and a median of 1.8.

Table 32: Effect of Violence in the Probability of Re-entry: Immigrants caught by the Border Patrol

Dependent variable: Intention to Re-enter to the US				
	1	2	3	4
Deaths per 10,000 inhabitants	-0.0052**	0.0007	0.0008	0.0007
	(0.0020)	(0.0012)	(0.0014)	(0.0018)
Observations	32,994	32,994	32,994	32,994
FE per quarter/year	No	Yes	Yes	Yes
FE per municipality	No	No	Yes	Yes
Individual controls[1]	No	No	No	Yes

[1]Individual controls include: years of schooling, marital status, duration in the US, age, age squared, family in the US, previous migratory experience, state where immigrants were working when they were captured by the border patrol, and controls for the place where they were caught (caught while trying to enter the US or when they were already in the US).
* Significant at the 10% level, ** Significant at the 5% level, ***Significant at the 1% level.
The regressions include sample weights and standard errors clustered by state.

5.5.2 Effect of Violence on the Outflows of Migrants: Sample of Migrants returned by the Border Patrol

When I use the dataset of migrants returned by the Border Patrol the results are in line with the previous findings. Table 33 shows once more that an increase in violence is associated with an increase in the outflows of migrants from Western Mexico and a decrease in the outflows of migrants from Southern Mexico. An increase of 1 death per 10,000 inhabitants increases the probability to re-enter for individuals from Western Mexico by 0.43 percentage points, increases the probability to re-enter by 0.14 percentage points for immigrants from Northern Mexico, but decreases the probability for migrants from Southern Mexico by 0.33 percentage points.[14]

This sample of workers includes individuals who were caught while they were trying to enter the US, and workers who have been in the US for longer periods of time. The first group of workers (caught while trying to cross) has characteristics similar to those of workers studied in the previous section; however, the second group of workers (caught after being in the US for long period of time) can be used to understand if the effect of violence can change as duration in the US increases. Table 34 shows results obtained when I run regression 5 for

[14]Even thou these new results cannot be compared numerically with the results obtained in the previous section; they provide us valuable information relative to the direction of the change in the outflows of migrants resulting from increases in violence.

Table 33: Effect of Violence in the Probability of Re-entry: Immigrants caught by the Border Patrol

Dependent variable: Intention to Re-enter to the US				
	1	2	3	4
Deaths per 10,000 inhabitants* Northern	-0.0034***	0.0010*	0.0014**	0.0014**
	(0.0004)	(0.0004)	(0.0004)	(0.0003)
Deaths per 10,000 inhabitants* Southern	-0.0101***	-0.0010	-0.0029**	-0.0033***
	(0.0010)	(0.0009)	(0.0007)	(0.0005)
Deaths per 10,000 inhabitants* Central	-0.0547***	-0.0061	0.0026	0.0047
	(0.0049)	(0.0041)	(0.0040)	(0.0025)
Deaths per 10,000 inhabitants* Western	-0.0215***	-0.0021	0.0038	0.0043**
	(0.0022)	(0.0019)	(0.0017)	(0.0011)
Observations	32,994	32,994	32,994	32,994
FE per quarter/year	No	Yes	Yes	Yes
FE per municipality	No	No	Yes	Yes
Individual controls	No	No	No	Yes

[1]Individual controls include: years of schooling, marital status, duration in the US, age, age squared, family in the US, previous migratory experience, state where immigrants were working when they were captured by the border patrol, and controls for the place where they were caught (caught while trying to enter the US or when they were already in the US).
* Significant at the 10% level, ** Significant at the 5% level, ***Significant at the 1% level.
The regressions include sample weights and standard errors clustered by region.

Table 34: Effect of Violence in the Probability of Re-entry: Immigrants caught by the Border Patrol

Dependent variable: Intention to Re-enter to the US				
	1	2	3	4
Deaths per 10,000 inhabitants* Northern	0.0006	0.0022*	0.0045**	0.0021
	(0.0013)	(0.0009)	(0.0009)	(0.0015)
Deaths per 10,000 inhabitants* Southern	-0.0041*	-0.0055**	-0.0060*	0.0019
	(0.0017)	(0.0016)	(0.0021)	(0.0030)
Deaths per 10,000 inhabitants* Central	0.0141	0.0301**	-0.0198**	-0.0527***
	(0.0075)	(0.0060)	(0.0045)	(0.0078)
Deaths per 10,000 inhabitants* Western	0.0203**	0.0097*	-0.0183**	0.0098
	(0.0047)	(0.0041)	(0.0040)	(0.0062)
Observations	15,822	9,749	3,521	3,902
Border crosser and Mexican residence	Yes	No	No	No
Duration in U.S.	-	<12 months	12<=months<72	months>=72
FE per quarter/year	Yes	Yes	Yes	Yes
FE per municipality	Yes	Yes	Yes	Yes
Individual controls	Yes	Yes	Yes	Yes

[1]Individual controls include: years of schooling,
* Significant at the 10% level, ** Significant at the 5% level, ***Significant at the 1% level.
The regressions include sample weights and standard errors clustered by region.

four groups of workers.

The first one includes individuals caught crossing the border who report his country of residence is Mexico, and four more categories according to their time in the US. The results show that for individuals caught crossing the border and for individuals with less than one year in the US the results are similar to the ones found in the previous section, an increase in violence increases the outflows from Western Mexico but decreases the outflows from Southern Mexico. However, when I analyze the behavior of individuals with more than one year in the US the results change. For individuals from Central, Western and Southern Mexico increases in violence are associated with a decrease in the probability to re-enter the US. These results show that it is important to analyze the effect of violence for individuals with different durations in the US since the channels through which violence affects them and their decision to try to re-enter the US can change the longer they are in the United States.

5.5.3 Effect of Violence on the Outflows of Migrants: Analyzing the Differences by Region

Summarizing, the results show that the increase in violence increases the outflows of migrants from Western Mexico, but decreases the outflows of migrants from Southern Mexico.

These findings highlight the importance of studying migration differentiating individuals from different regions of Mexico. Migrants have different characteristics and respond differently to changes in social and economic conditions in Mexico[15].

Western Mexico has been traditionally known as source of migrants; its migrants have larger migration networks at destination, are more likely to have previous migratory experience, and are more likely to be sojourners. These characteristics might have contributed to the increase in migration observed when violence increased.

[15] I analyze the migratory behavior of individuals aged 15-65 migrating to the U.S. to work or look for a job. In the future I will analyze the effect of violence on the migration behavior of other types of migrants like wives, parents and children who migrate but not to work or look for a job.

Southern Mexico has been known as source of internal migration. However, since the 90's experienced important increases in their migration rates to the United States due to different factors such as the introduction of recruiting programs for agricultural workers (H2A visas), and the deterioration in the economic conditions of inhabitants of that region of Mexico.

When we look at the theoretical prediction of the effect of violence, we find that violence has an ambiguous effect on migration outflows.

The neoclassical theory of migration states that an individual will migrate if the earnings at destination net of migration costs are higher than earnings at home. If the increase in violence decreases expected earnings in Mexico the theory predicts that more individuals will find it optimal to migrate to the United States.

Furthermore, violence could also increase migration costs. Migration costs have several components, including monetary costs such as transportation costs, and non-monetary costs such as the emotional cost of being away from family. An increase in violence could increase transportation costs, for example, if migrants choose the route to the US that decreases the probability of being targeted by criminal groups and not the shortest, fastest, or cheapest. Moreover, violence could also increase the emotional cost of being away if individuals leave their families back in Mexico in areas where they can be target of criminal groups, or decrease it if individuals can migrate with their families to the US. Therefore, if migration costs increase due to the increase in violence, fewer individuals will find it optimal to migrate.

One way to explain why the outflows of workers from Western Mexico increased but the outflows of workers from Southern Mexico decreased would be if the social and economic cost of violence is different for individuals from different regions of Mexico. For example, if individuals from Western Mexico suffer a large drop in expected earnings due to the increase in violence relative to residents of Southern Mexico.

In order to test if the cost of violence is different for individuals from different regions I use Mexico's 2011 and 2012 National Survey on Victimization and Perceptions of Public Safety (ENVIPE). This survey provides estimates of the number of crime victims, economic losses due to crime, as well as perceptions of public safety at the national and sub-national

levels. Since the decision to migrate is determined by expected earnings, it is important to analyze not only the actual cost of violence for those who were victims of a crime, but also the perception of individuals with respect to the probability of becoming a victim. Violence impacts individuals or businesses, decreases investment, consumption as well as individuals' earnings, job performance or the ability to keep a job.

Table 35 shows regression results. Columns 1 and 2 show the perception of individuals with respect to public safety. The dependent variable is a dummy variable equal to 1 if the individual feels unsafe in their own neighborhood (municipality). Columns 3 and 4 measure the actual economic loss due to crime and the dependent variable is the logarithm of the real loss. The independent variables included in all regressions are dummy variables for regions of Mexico, urban, suburban and rural areas, sex and year of the survey. I also include number of homicides by municipality committed between 2007 and the survey year per 10,000 inhabitants, age and years of schooling. Finally, I include a dummy variable for individuals in the labor force, unemployed as well as dummy variables for type of job (farm workers, factory workers, owners/employers, individuals who work without pay and self-employed). Regressions shown in columns 2, 4 and 6 also include the annual crime rate by municipality per 10,000 inhabitants.[16] All regressions include fixed effects by year.

The results show that individuals from Western Mexico feel more unsafe in their own municipality and have higher losses due to crime. Mexicans from Western states are 6.7 percentage points more likely to feel insecure in their neighborhood than individuals from Southern Mexico, followed by individuals from Central (5.4 percent) and Northern Mexico (3.2 percent).

Similarly, individuals from Western Mexico have the highest economic losses due to crime. They had loses 11.66 log points higher than individuals from Southern Mexico followed by individuals from Northern Mexico (9.68 log points).

These results can help us to understand why an increase in violence only increased the outflows of workers from Western Mexico. They have the highest drops in expected earnings

[16] The crime rate is the number of reported crimes. The types of crimes include property crimes, personal crimes, kidnapping, and sexual crimes among others.

Table 35: Perception of Public Safety and Losses due to Crime by Region

VARIABLES	Feel unsafe in your neighbourhood (municipality)		Logarithm of economic losses due to crime	
	(1)	(2)	(3)	(4)
Excluded category: Southern Mexico				
Western Mexico	**0.0664*** **	**0.0670*** **	**0.1082*** **	**0.1166*** **
	(0.004)	(0.004)	(0.029)	(0.029)
Central Mexico	0.0597***	0.0543***	-0.0554*	-0.0293
	(0.004)	(0.004)	(0.029)	(0.030)
Northern Mexico	0.0315***	0.0317***	0.0926***	0.0968***
	(0.004)	(0.004)	(0.027)	(0.027)
Deaths per 10,000 inhabitants	0.0049***	0.0049***	(0.001)	(0.001)
(per municipality)	(0.000)	(0.000)	(0.001)	(0.001)
Crime rate per 10,000 inhabitants		-0.0004***		0.0016***
(per municipality)		(0.000)		(0.001)
Constant	0.6476***	0.6573***	6.9649***	6.9260***
	(0.007)	(0.007)	(0.056)	(0.058)
Observations	129,529	129,529	24,977	24,977
R-squared	0.0395	0.0399	0.0232	0.0236

in Mexico and more individuals will be better off if they migrate to the US.

5.6 CONCLUSIONS

I study the effect of drug-violence on the outflows of migrants from Mexico to the United States. The results show the importance of studying migration flows differentiating individuals from different regions of Mexico. Migrants have different characteristics and respond differently to changes in social and economic conditions in Mexico.

The results show that individuals from Western and Southern Mexico are more likely to change their migratory behavior as response to changes in violence.

To study the outflow of migrants I use two different datasets finding similar results. An increase in violence increases migration rates from Western Mexico and decreases migration rates from Southern Mexico. I find that an increase of 1 death per 10,000 inhabitants increases migration rates from municipalities of Western Mexico by 0.06 percentage points, but decreases migration rates from municipalities of Southern Mexico by 0.10 percentage points.

Additionally, I use a sample of workers returned by the Border Patrol to study how their

probability to re-enter the US differs for individuals from municipalities with different levels of violence. The results show that an increase of 1 death per 10,000 inhabitants increases the probability to re-enter for individuals from Western Mexico by 0.43 percentage points, but decreases the probability to re-enter for migrants from Southern Mexico by 0.33 percentage points.

The neoclassical theory of migration states that an individual will migrate if the earnings at destination net of migration costs are higher than earnings at home. If the increase in violence decreases expected earnings in Mexico the theory predicts that more individuals will find it optimal to migrate. However, if violence increases migration costs the prediction is that fewer individuals will migrate.

One way to explain why the outflows of workers from Western Mexico increased but the outflows of workers from Southern Mexico decreased would be if the social and economic cost of violence is different for individuals from different regions of Mexico. For example, if individuals from Western Mexico suffer a large drop in expected earnings due to the increase in violence relative to residents of Southern Mexico.

I test if the decrease in earnings is different for different regions of Mexico using Mexico's 2011 and 2012 National Survey on Victimization and Perceptions of Public Safety. The results show that individuals from Western Mexico feel more unsafe in their own municipality and have higher losses due to crime. Therefore, the large decrease in their expected earnings in Mexico could have contributed to the increase in the outflows of workers from that region of Mexico.

As future extension I would like to analyze if the effects found in this chapter are similar for men and women and how duration in the United States change individuals' behavior. Additionally it would be interesting to analyze the effect of violence on the migratory behavior of other types of migrants like wives, parents and children who migrate but not to work or look for a job.

6.0 APPENDIX

6.1 APPENDIX TO CHAPTER 1

6.1.1 Calculating probability of success crossing the border

According to the United States Border Patrol, during the fiscal year of 2011 there were 340,252 apprehensions. Estimates from the GAO[1] show that during that period of time the estimated known illegal entries were 533,571. These numbers imply that the Border Patrol has an apprehension rate of 36 percent. Carrion-Flores (2006) uses the Mexican Migration Project, a survey conducted in Mexican towns of Western Mexico historically characterized as important major suppliers of Mexican immigrants to estimate an apprehension rate of 32 percent.

Additionally, it has been documented that an important number of migrants try to re-enter after being apprehended by the Border Patrol. Data from the EMIF shows that on average 72 percent of the immigrants caught reported intention to re-enter the US within a few days.

Using this information I calculate the probability of crossing successfully. I assume I have 100 migrants trying to enter the US, 64 percent of them are successful in their first try, and 36 will be caught by the Border Patrol. Of those 36 caught, 72 percent will try to re-enter (26), and 10 will go back to Mexico. If 26 migrants try to re-enter, 17 of them will be successful in their second try (64 percent of them), 9 will be apprehended, and 6 of

[1] United States Government Accountability Office. Report GAO-13-25 "BORDER PATROL: Key Elements of New Strategic Plan Not Yet in Place to Inform Border Security Status and Resource Needs", December 2012

the apprehended will try to re-enter (72 percent). The numbers of migrants who return to Mexico are 10 after the first try and 3 after the second try. If 6 individuals try to enter a third time, 4 will be successful (64 percent of them), 2 will be apprehended, and 1 will return to Mexico. Therefore, the probability of successfully crossing the border is estimated to be 86 percent. I estimate an average number of crossings of the individuals who were caught at least one time while entering the US of 1.33 times. This number is in line with the 1.24 estimated using the data of individuals returned by the Border Patrol from the EMIF.

6.2 APPENDIX TO CHAPTER 2

6.2.1 Graphs

Table 36: States with more Drug-related Homicides

Total Homicides between 2007 and 2011		
State	Total	Percentage of Total
Chihuahua	12,260	27.51%
Sinaloa	5,305	11.90%
Guerrero	3,961	8.89%
Durango	2,502	5.61%
Baja California	2,244	5.04%
Michoacán	2,127	4.77%
Tamaulipas	2,040	4.58%
Mexico	2,027	4.55%
Nuevo Leon	1,642	3.68%
Jalisco	1,551	3.48%

Figure 19: Monthly Drug Trade Related Homicides (Dec. 2006- Sep. 2011)

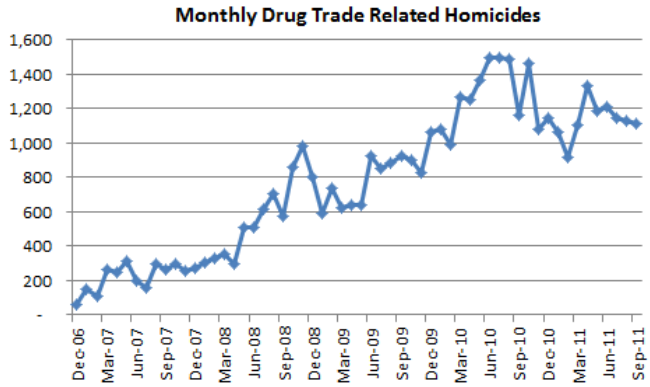


Figure 20: Northern, Western, Central and Southern Mexican States

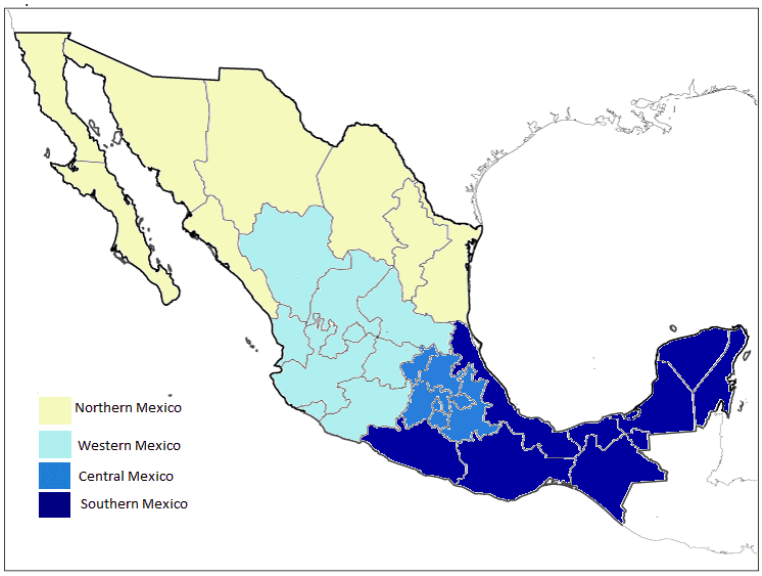
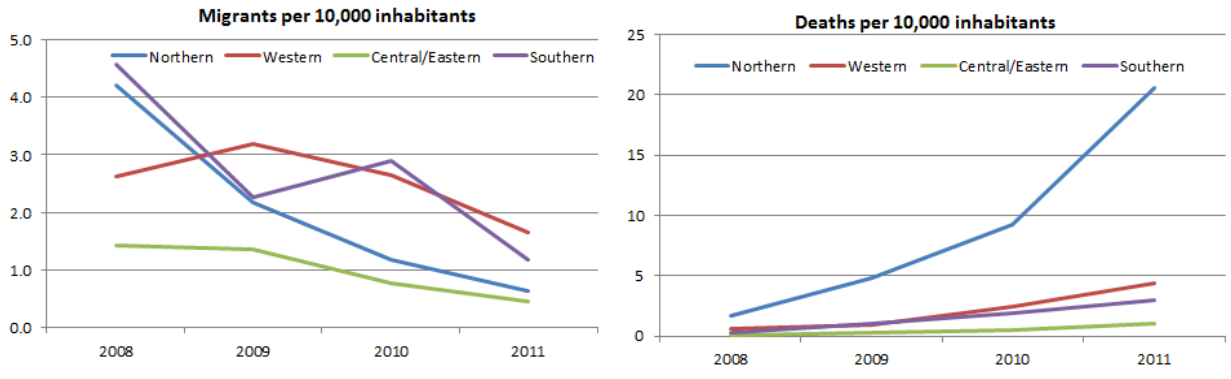


Figure 21: Migrants and Deaths per 10,000 inhabitants



BIBLIOGRAPHY

[1] Adelman, I. and Taylor, E. (1990). "Is Structural Adjustment with a Human Face Possible? The Case of Mexico." *Journal of Development Studies.* 26: 387–407.

[2] Arceo-Gómez, E. (2012). "Drug-Related Violence, Forced Migration and the Changing Face Of Mexican Immigrants in the United States." Working Paper, Centro de Investigación y Docencia Económicas.

[3] Becker, A. (2009, March 20), "New Migrant Class Flees Mexican Drug War," Center for Investigative Reporting, http://cironline.org/reports/new-migrant-class-flees-mexican-drug-war-2265

[4] Blanchflower, D. and Oswald A. (1998)., "What Makes an Entrepreneur?." *Journal of Labor Economics,* 16, pp. 26-60.

[5] Borjas, G. J. (1985). "Assimilation, Changes in Cohort Quality, and the Earnings of Immigrants." *Journal of Labor Economics,* Vol. 3, No. 4, pp. 463-489.

[6] Borjas, G.J. (1996). "The Earnings of Mexican Immigrants in the United States." *Journal of Development Economics* 51(1):69-98.

[7] Borjas, G.J. (1999). Heaven's Door: Immigration Policy and the American Economy. Princeton, NJ: Princeton University Press.

[8] Borjas G. (1987). "Self-selection and the earnings of immigrants". *American Economic Review*, 77 (4): 531-553.

[9] Borjas, G. J. (1989). "Immigrant and Emigrant Earnings: A Longitudinal Study," *Economic Inquiry* 27 , 21-37.

[10] Borjas, G. J. (1994). "The economics of immigration". *Journal of Economic Literature*, 32, 1667–1717.

[11] Borjas G. and Bratsberg B. (1996). "Who leaves? The outmigration of the foreign-born". *Review of Economics and Statistics*, 87 (1): 165-176.

[12] Brownell, P. B. (2010). "Wages Differences Between Temporary and Permanent Immigrants." *International Migration Review*, 44: 593–614.

[13] Carletto, C., Davis B., Stampini M., Trento S., and Zezza A., (2004). "Internal Mobility and Interantional Migration in Albania." FAO ESA Working Paper No. 04-13, 2004.

[14] Chiquiar, D. and G.H. Hanson (2005). "International Migration, Self-Selection, and the Distribution of Wages: Evidence from Mexico and the United States. *Journal of Political Economy*, 113(2): 239-281

[15] Chiswick, B.R. (2000) "Are Immigrants Favorably Self-Selected?" Pp. 61-76 in Migration Theory: Talking Across Disciplines, edited by C.B. Brettell and J.F Hollifield. New York: Routledge.

[16] Dell M. (2012). "Trafficking Networks and the Mexican Drug War", Working Paper, MIT.

[17] Dinerman, I.R. (1982). "Migrants and Stay-at-Homes: A Comparative study of rural Migration from Michoacan, Mexico." Center for US-Mexican Studies, Monograph Series No. 5. U.C. San Diego.

[18] Djajic, S. and Melbourne, R. (1988). "A General Equilibrium Model of Guest-worker Migration." *Journal of International Economics* 25:335-351.

[19] Duleep H. (1994) "Social Security and the Emigration of Immigrants." Social Security Bulletin, Vol. 57, No. 1, 1994.

[20] Duleep H. and Dowhan D. (2008) "Adding Immigrants to Microsimulation Models" Social Security Bulletin, Vol. 68, No. 1, 2008.

[21] Dustmann, C., (1995). "Savings behavior of migrant workers: A Life-Cycle Analysis." Zeitschrift fFur Wirtschafts- und Sozialwissenschaften 115, 511–533.

[22] Dustmann, C., (1997). "Return Migration, Uncertainty and Precautionary Savings." *Journal of Development Economics*, 52, 295–316.

[23] Dustmann C. and Weiss Y. (2007). "Regurn Migration: Theory and Empirical Evidence from the UK". *British Journal of Industrial Relations, June 2007 pp. 236-256.*

[24] Dustmann and Kirchkamp (2002). "The Optimal Migration Duration and Economic Activities after Re-Migration." *Journal of Development Economics*, 67, 351-372, 2002.

[25] Evans, David S. and Leighton, Linda S.,(1989). "Some Empirical Aspects of Entrepreneurship." *American Economic Review,* Vol. 79, Issue 3, p. 519-535 1989.

[26] Feliciano, C. (2005). "Educational selectivity in US Immigration: How do immigrants compare to those left behind." *Demography*, Vol.42, No. 1, pp. 131-152.

[27] Fernández-Huertas, J. (2011). "New Evidence on Emigrant Selection". *The Review of Economics and Statistics* 93:72-96.

[28] Funkhouser, E., (1992). "Remittances from international migration: a comparison of El Salvador and Nicaragua." *Review of Economics and Statistics* 77, 137– 146.

[29] Germenji, E., and Swinnen J. (2004). "Impact of remittances on household-based farms in rural Albania." Paper presented at the International Conference on New Perspectives on Albanian Migration and Development, Albania, 2004.

[30] Gitter , S., Gitter R., Southgate, D. (2008). "The Impact of Return Migration to Mexico." Estudios Economicos, Vol. 23, No. 1, January-June 2008.

[31] Hanson, G. H., (2006). "Illegal Migration from Mexico to the United States." NBER Working Paper 12141.

[32] Hill, J. K. (1987). "Immigrant decisions concerning the duration of stay and migration frequency," *Journal of Development Economics*, 25, 221–234.

[33] Holtz-Eakin, D., Joulfaian D., and Rosen H., (1994). "Sticking it Out: Entrepreneurial Survival and Liquidity Constraints." *Journal of Political Economy*, Vol. 102 (1), pp. 53-75.

[34] Hurst E. and Lusardi A. (2004). "Liquidity Constraints, Household Wealth, and Entrepreneurship." *Journal of Political Economy*, University of Chicago Press, vol. 112(2), pages 319-347.

[35] Ibarraran, P. and D. Lubotsky (2007) . "Mexican Immigration and Self-Selection: New Evidence from the 2000 Mexican Census" in Mexican Immigration to the United States (eds. G.J. Borjas) University of Chicago Press (for NBER).

[36] Ilahi, N.(1999). "Return Migration and Occupational change." *Review of Development Economics,* 3,170-86.

[37] Jasso, G. and M.R. Rosenzweig (1982). "Estimating the emigration rates of legal immigrants using administrative and survey data: the 1971 cohort of immigrants to the United States.." *Demography*, 19: 279-290.

[38] Jasso, G. and M.R. Rosenzweig (1990). "Self-Selection and the Earnings of Immigrants: Comment." *American Economic Review* 80:298-304.

[39] Kaestner, R. and Malamud, O., (2010). "Self-Selection and International Migration: New Evidence from Mexico," NBER Working Papers 15765, National Bureau of Economic Research.

[40] King, R., and Vullnetari J., (2003). "Migration and Development in Albania." Development Research Centre on Migration, Globalization and Poverty, Sussex Centre for Migration Research, Working Paper C5, 2003.

[41] Kule, D., Mancellari, A., Papapanagos H., Qirici S., and Sanfey P., (2002). "The Causes and Consequences of Albanian Emigration during Transition: Evidence from Micro-data." *International Migration Review,* 36.1, pp. 229-239.

[42] Lee, E.S. (1966). "A Theory of Migration." *Demography* 3:47-57.

[43] Lindstrom, D. P. (1996). "Economic Opportunity in Mexico and Return Migration from the United States", *Demography,* Vol. 33, no. 3, 357-374.

[44] López, G. (1986). "La Casa Dividida: Un Estudio de Caso Sobre Migación a Estados Unidos en un Pueblo Michoacano." Zamora, Michoacán: El Colegio de Michoacán.

[45] Lucas, R., and Stark O. (1985) "Motivation to Remit: Evidence from Botswana," *Journal of Political Economy*, Vol. 93, No. 5, 901-918.

[46] Massey, D.S. (1987)."Understanding Mexican Migration to the United States." *American Journal of Sociology* 92:1372-403.

[47] Massey, D.S. (1999)."Why Does Immigration Occur? A Theoretical Synthesis." Pp. 34-52 in Handbook of International Migration, edited by C. Hirschman, P. Kasinitz, and J. DeWind. New York: Rusell Sage Foundation.

[48] Massey, D. S., Arango, J., Graeme, H., Kouaoci A., Pellegrino A. and Taylor E. (1993), "Theories of International Migration: A Review and Appraisal."*Population and Development Review*, Vol. 19, No. 4, pp. 699–751.

[49] McCornick, B. and Wahba, J. (2001): "Overseas work experience, savings and entrepreneurship amongst return migrants to LDCs." *Scottish Journal of Political Economy*, Special Conference Issue, 48: 164-78.

[50] Mesnard, A. (2004). "Temporary Migration and Capital Market Imperfections." *Oxford Economic Papers*, 2004, 56.2, pp. 242-262.

[51] McKenzie, D. and Rapaport H. (2010). "Self-Selection Patterns in Mexico-US Migration: The Role of Immigration Networks." *The Review of Economics and Statistics*. MIT Press, vol. 92(4), pages 811-821.

[52] Murillo Castaño, G. (1988). "Effects of Emigration and Return on Sending Countries: The Case of Columbia." International Migration Today. Ed. C. Stahl. Geneva: UNESCO.

[53] Murphy, R. (2000). "Return Migration, Entrepreneurship and Local State Corporatism in Rural China: The Experience of Two Counties in South Jiangxi." *Journal of Contemporary China*, 2000, 9.24, pp. 231-4.

[54] Nickell J.K. (2013). "Immigration: The New — and Rich — Immigrants from Mexico: How Their Money is Changing Texas." January. 14, 2013. Time Magazine.

http://nation.time.com/2013/01/14/the-new-and-rich-immigrants-from-mexico-how-their-money-is-changing-texas/

[55] Orozco S. (2011). "Labor Market Effects of Immigration Policies" Working Paper, University of Pittsburgh.

[56] Orrenius, P. and Zavodny, M. (2005). "Self-Selection Among Undocumented Immigrants from Mexico." *Journal of Development Economics* 78: 215-240.

[57] Passel, J.S. (2006). "Estimates of the Size and Characteristics of the Undocumented Population." Pew Hispanic Center.

[58] Passel, J., Cohn D., and Gonzalez-Barrera, A. (2012). "Net Migration from Mexico Falls to Zero—and Perhaps Less". Pew Hispanic Center.

[59] Piracha and Vadean (2010). "Return Migration and Occupational Choice: Evidence from Albania". World Development, Volume 38, Issue 8, August 2010, Pages 1141–1155.

[60] Portes, A. and R.G. Rumbaut. (1996). "Immigrant America: A Portrait". Berkeley: University of California Press.

[61] Rios V., and Shirk D. (2011). "Drug Violence in Mexico: Data and Analysis Through 2010". Trans-Border Institute.

[62] Roy, A.D. (1951). "Some Thoughts on the Distribution of Earnings." Oxford Economic Papers 3:135-46.

[63] Schulkin P. (2012). "The Revolving Door Deportations of Criminal Illegal Immigrants." Center for Immigration Studies.

[64] Schultz, T.P. (1984). "The Schooling and Health of Children of US Immigrants and Natives." *Research in Population Economics* 5:251-88.

[65] Sjaastad, L. (1962). "The Costs and Returns of Human Migration." *Journal of Political Economy*, Vol. 70, No. 5, Part 2, pp. 80-93.

[66] Stark, O. (1991) The Migration of Labor. London: Basil Blackwell.

[67] Taylor E. (1996). "Development Strategy, Employment and Migration: Insights from Models." Organization for Economic Co-operation and Development [OECD], 1996. 207 p. (Development Centre Seminars).

[68] Taylor, J.E. (1999), "The New Economics of Labor Migration and the Role of Remittances", *International Migration,* Vol. 37(1), pp. 63-86.

[69] Taylor, J.E., Mora, J., Adams, R. and Lopez-Feldman, A. (2005). "Remittances, Inequality and Poverty: Evidence from Rural Mexico". University of California, Davis, Working Paper No. 05-003.

[70] United States Government Accountability Office (2012). "Report GAO-13-25 "Border Patrol: Key Elements of New Strategic Plan Not Yet in Place to Inform Border Security Status and Resource Needs" , December 2012

[71] Wahba and Zenou (2009). "Out of Sight, Out of Mind: Migration, Entrepreneurship and Social Capital." CEPR Discussion Papers 7552, C.E.P.R. Discussion Papers.

[72] Warren, R. and Peck, J.M. (1980). "Foreign born emigration from the United States". *Demography*, 17: 71-84.

[73] Woodruff, C. (2006). "Mexican Microenterprise Investment and Employment: The Role of Remittances." Working Paper.

[74] Woodruff, C., and Zenteno, R. (2004). "Remmittances and Mircroenterprises in Mexico." University of California at San Diego. Working Paper 2004.

[75] Woodruff, C., and Zenteno, R. (2007). "Migration networks and microenterprises in Mexico." *Journal of Development Economics*, 82, 509–528.